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ABSTRACT

This report characterizes the resources that exist in the state of California which might be more fully utilized through legislation providing incentives for its development. Selected existing postsecondary education programs and selected information systems are reviewed to exemplify successful uses of instructional and informational media. An approach to instructional planning is described which could aid planners in matching instructional materials and instructional delivery systems to learner needs. A number of conclusions drawn from the study led to the following recommendations: (1) develop regional information centers which will gather, organize, and provide access to information including services, courses and programs, instructional products, and student characteristics; (2) adopt a policy of funding new non-traditional postsecondary educational programs which demonstrate full utilization of existing resources, addressing educational needs of highest priorities, involving institutions across educational segments, sharing the materials developed by the program(s), and systematically designing programs and assessing program efforts; (3) establish a policy and review board to determine the priorities for non-traditional postsecondary education programs and determine procedures for grant proposal solicitation and grant awards; (4) create a state library of instructional materials from programs developed through grant awards. (VT)

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Postsecondary Alternatives: Meeting California's Educational Needs
A Feasibility Study

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Fourth Technical Report

INSTRUCTIONAL TECHNOLOGY AND MEDIA FOR POSTSECONDARY ALTERNATIVES

Richard E. Clark
David P. Rubin

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Prepared for the California Legislature
September 1975

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PREFACE

The Task

During the initial phase of this study we were asked to:

1) Prepare a critical review of (a) various media applicable to educational uses; (b) existing media-based postsecondary education programs in California, in the United States, and in the world;

2) Prepare brief descriptions of one or more recommended media-oriented models for the State of California; and

3) Attend staff conferences to discuss the progress of the study and attend advisory group meetings.

During subsequent discussions and meetings with advisory groups our concept of the task changed slightly. It was decided that:

1) The study of educational media should be expanded to include instructional technology (i.e., the systematic design, development, assessment and delivery of instruction);

2) Rather than a critical review of <u>all</u> media and technology-based postsecondary programs we should

attempt to characterize California activities and produce case studies of activities in other states and nations that appeared to be relevant for the unique needs in California; and

3) We should draw conclusions and make specific recommendations for California alternative postsecondary education programs rather than generate a number of media-oriented models.

The first change (to expand our effort to include instructional technology) was dictated by our review of local, national and international postsecondary trends and experiences. It seemed clear to us that a report that focused primarily on devices for delivering instruction without considering how that instruction is developed and assessed would be limited and unrepresentative of the more successful postsecondary alternative programs in other states.

The decision to characterize rather than survey all existing media and technology-based activities in California was dictated by a lack of time, resources and available information. In some cases institutions are reluctant to release information because budgets for these projects might be questioned. In other cases it was impossible to determine where the information was available. Many campuses do not coordinate these activities and a survey would have to be conducted on a department or individual faculty member

level. A complete survey was therefore beyond the scope of our effort. As the methodology section will explain however, we attempted to sample institutions and individuals in programs in order to build a picture of existing resources and activities.

The third change (to draw conclusions and make recommendations rather than generate media models) was determined by our first change (to include instructional technology concerns) and by our assessment of California's needs. Media delivery models need to be based on decisions regarding the design, assessment and development of instruction, on an assessment of student needs, and on a determination of constraining factors limiting alternative means for the delivery of courses. After surveying instructional technology and media in California, we have concluded that statewide delivery system-oriented designs are inappropriate. Student needs, delivery technologies, and instructional management techniques are changing rapidly. We believe it would be a mistake for California to become "locked in" to any one particular over-arching delivery system.

Methodology

It was expected that most of the descriptive material for this report would be gathered from existing or in-process studies, reports and position papers produced by

state agencies, postsecondary institutions, consortia, foundations, etc.

We attempted to systematically collect existing data on alternative postsecondary projects by developing a taxonomy of important terms and categories. The taxonomy appears in Chapter III on instructional technology. When reviewing studies and reports we attempted to organize the information about programs by using the taxonomy categories. We had hoped to produce comparable descriptions of programs in this manner.

We were aided in our research by members of the California Advisory Committee, the National Advisory Panel, and many administrative, faculty and staff members in the three state postsecondary segments. In our efforts to check the accuracy of published reports and update information we placed calls to many professionals in this field and although we were not able to contact all previous authors because of time restrictions, those who were reached gave us a good deal of time and assistance. We owe a special debt of gratitude to Professor James Brown, ex-dean of graduate studies at California State University, San Jose and now a professor of education at that institution. Professor Brown acted as a consultant to the study and reviewed a preliminary draft of this report.

Many of the reports and studies described in this document were supplied to us by the helpful and informed staff

of the ERIC Clearinghouse and Information Resources at Stanford University. The Clearinghouse is funded by a grant from the National Institute for Education in Washington, D.C. to collect documents that relate to instructional media and technology, libraries, and information studies. The Clearinghouse collection was particularly useful for descriptions of alternative postsecondary programs in other states and nations.

Problems

Very soon after we began collecting data it became obvious that information was not available that would allow us to use our taxonomy. We also learned that there was no mechanism for gathering that information on a departmental, institutional, or segmental level. Calls to selected departments and institutions indicated that each of the several hundred California projects would have to be studied separately in order to obtain comparable information. We were therefore left with existing reports and data from those involved in the projects we selected for study.

Since one of our goals was to attempt to characterize the types of resources (both material and human) that were available in California we tended to choose established and successful projects rather than those that were weak or in planning stages. In some areas there were many successful projects available for study and choices had to be made.

Our selection of projects is therefore not complete but an attempt was made to make them representative of successful applications of media and technology.

I. INTRODUCTION

The role of instructional technology in education has been the subject of much investigation, speculation and debate. There are those educators who envision a future in which all members of society will have available to them lifelong education through sophisticated electronic instructional systems. They imagine, for example, telephone access to computerized libraries which will transmit audiovisual materials to television sets in the home. These forecasts usually point to the pervasiveness of information technologies such as broadcast and cable television and telephone utilities; the exponential growth of the computer industry; and the increasing need for and consumption of information in "post-industrial" societies. The forecasts usually conclude with prophecies regarding the number of adults who will be engaged in media-based postsecondary education programs.

At the other extreme, some educators argue for the time-tested higher education model. They are against the use of instructional delivery devices which have been the captives of entertainment-based industries. They point to the lack of evidence that media make a difference in education, and cite the relatively high cost of most media-based instruction. They conclude that we should continue full support of our present system ". . . until a better way is found."

While media advocates often reject traditional educational plans as overly limited, often favoring vague and wishful views of future learning societies, traditionalists, often defending vested interests, point to their established track records. They argue that support for other plans will only denigrate existing higher education systems. The test for those who govern education is to extract from the views of media-philes and traditionalists those elements which will serve to guide education towards a humane, meaningful, creative, and productive future.

Our view is that there is no single best way to educate all the adults in California. Californians express interests in a broad range of subject areas. California's current and potential postsecondary learners represent many segments of the population -- varying in age, race, educational attainment, geographic location, occupation, and income. Californians indicate a variety of reasons for desiring postsecondary education and a variety of preferences as to how they should learn (Hefferlin, et al., 1975). We believe that educational planners must develop an educational system which will be responsive to a heterogeneous population with diverse and changing educational needs and preferences.

In some cases we expect that media-based instructional programs will provide the most appropriate approach to serving the needs and preferences of Californians. In other

cases they will not. California already has a substantial investment in instructional media facilities. The state is also fortunate to have, as an additional resource, individuals and institutions at the forefront of the effort to utilize instructional media in education. There is represented in California as rich a knowledge base in instructional technology as exists anywhere in the world. In our view, California should develop educational policies which encourage the efficient development of all instructional resources in a deliberate and systematic manner.

The intent of our report is fourfold:

1) In Chapter II, we characterize the resources that exist in the state of California which might be more fully utilized through legislation providing incentives for its development.

2) In Chapters III and V, we review selected existing postsecondary education programs and selected information systems to exemplify successful uses of instructional and informational media and to provide a basis for recommendations and conclusions regarding the appropriate use of media in education.

3) In Chapter IV, we describe an approach to instructional planning which we believe will aid planners

in matching instructional materials and instructional delivery systems to learner needs.

4) In Chapter VI, we conclude with a description of general findings regarding the effective use of instructional media and recommendations for state planning to develop instructional media and technology resources.

One caveat is necessary before we begin. "Instructional technology and media" covers a very wide range of activities. Many different professional groups are utilizing diverse types of media in a variety of settings. Many special interest groups have different approaches to the provision of postsecondary education. Different professionals working in "instructional technology and media" prefer to be identified as working in the area of "broadcasting," "communications," "instructional television," "visual literacy," "audiovisual," "computer-assisted instruction," "programmed instruction," "instructional technology," "library media," "learning resources," "educational radio," "audiotape instruction," among others. We have found that these groups generally favor one kind of equipment for delivering instruction (e.g., computers or television) and/or some specific approach or combination of approaches to designing and evaluating instruction.

Although we urge continued support of a diversity of approaches to delivering postsecondary education, we feel that the highly-fragmented nature of professional affiliations has led to much confusion. When telecommunications or media delivery system studies have been conducted, state agencies have often contracted with one of these interest groups and ignored others. The resulting reports frequently reflect the specific interests of the contracting group (often a narrow view) and recommendations for legislation are opposed by other media special interest groups or by individual legislators who realize that the reports are limited.

In addition, there is no statewide (or regional) system of collecting information about programs and inventories of available delivery equipment. The state's procedures for purchasing equipment and for keeping records on instructional programs actually seem to prevent an accurate accounting of media and technology-based programs and facilities. Approved facilities are underutilized and successful programs at one institution are not easily adopted by others.

We believe that a current conceptual problem predominates in the media and technology area. It is an almost exclusive and limited concern with how postsecondary education gets delivered to the citizens of California. We will strongly suggest that state agencies broaden that concern to include the way in which instruction is designed and evaluated for the nontraditional student. We will also

recommend that the state design and operate an easily accessible information system that, among other things, keeps accurate records of existing programs and equipment.

II. THE RANGE OF MEDIA-BASED INSTRUCTIONAL PROJECTS IN CALIFORNIA

In this section we will attempt to characterize the variety of media-based delivery systems available in California. Our intent is to familiarize the reader with the range and salient characteristics of existing programs and facilities. We shall discuss existing media systems and programs in the areas of: (1) instructional television; (2) instructional television fixed service; (3) videotape; (4) telelibraries; (5) computer-assisted instruction; (6) educational telephone networks; (7) audiovisual and programmed learning; (8) library-based independent study programs; (9) newspaper-based instruction; (10) audiotape; (11) satellite technology; and (12) learning resources centers.

Public Broadcast Television Stations

Since KQED was established in San Francisco in 1954, the number of non-commercial PBS-affiliated television stations in California has grown to 11. The signals transmitted by these stations, boosted by translator stations, and further disseminated through commercially-operated cable lines, reach an audience of approximately 18.8 million. (Figures 1, 2, and 3 indicate areas of public television coverage, the location of public translator stations, and areas served by cable television.) As reported in

FIGURE 1

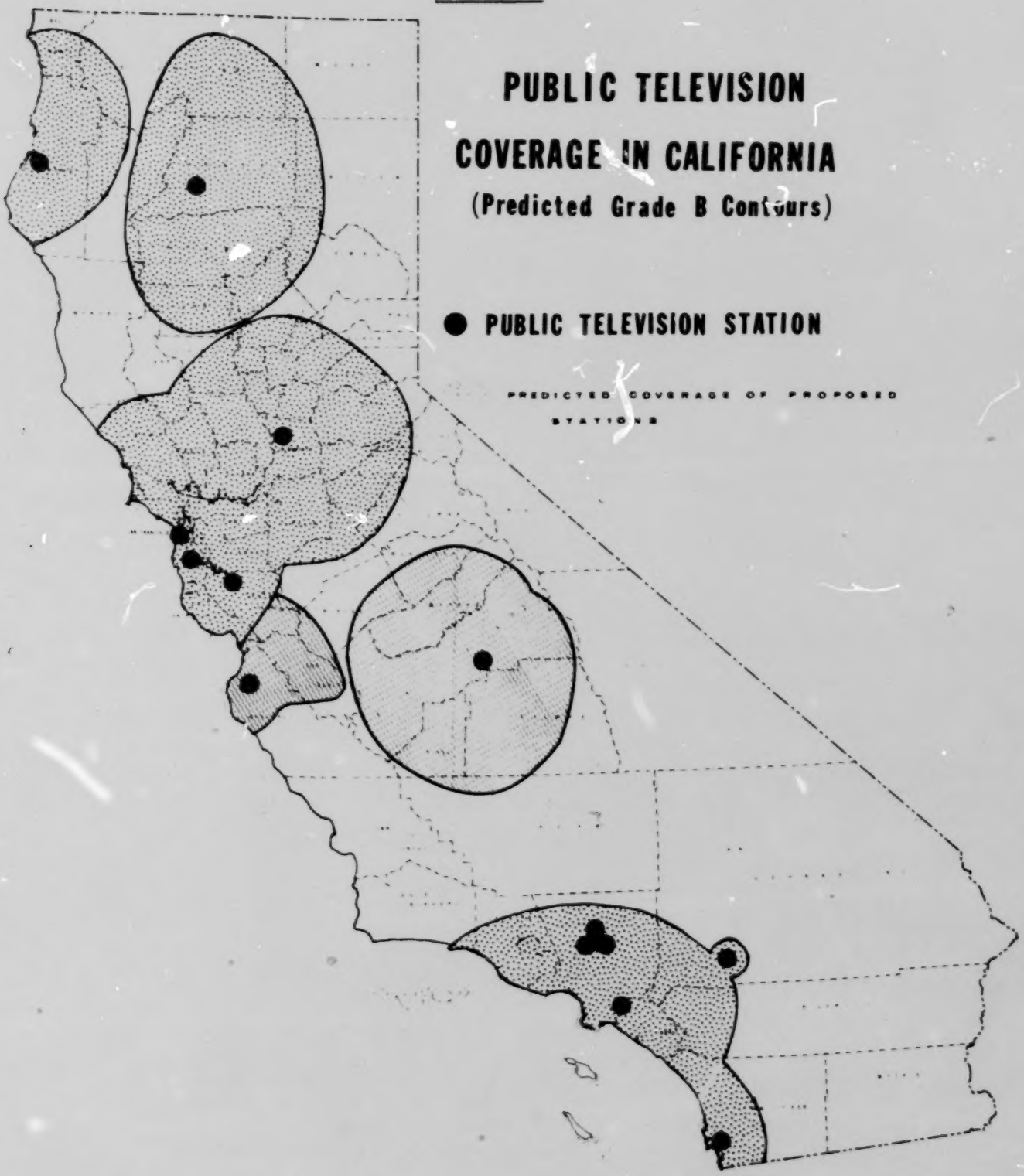
PUBLIC TELEVISION
COVERAGE IN CALIFORNIA
(Predicted Grade B Contours)
PUBLIC TELEVISION STATION
PREDICTED COVERAGE OF PROPOSED STATIONS

FIGURE 2

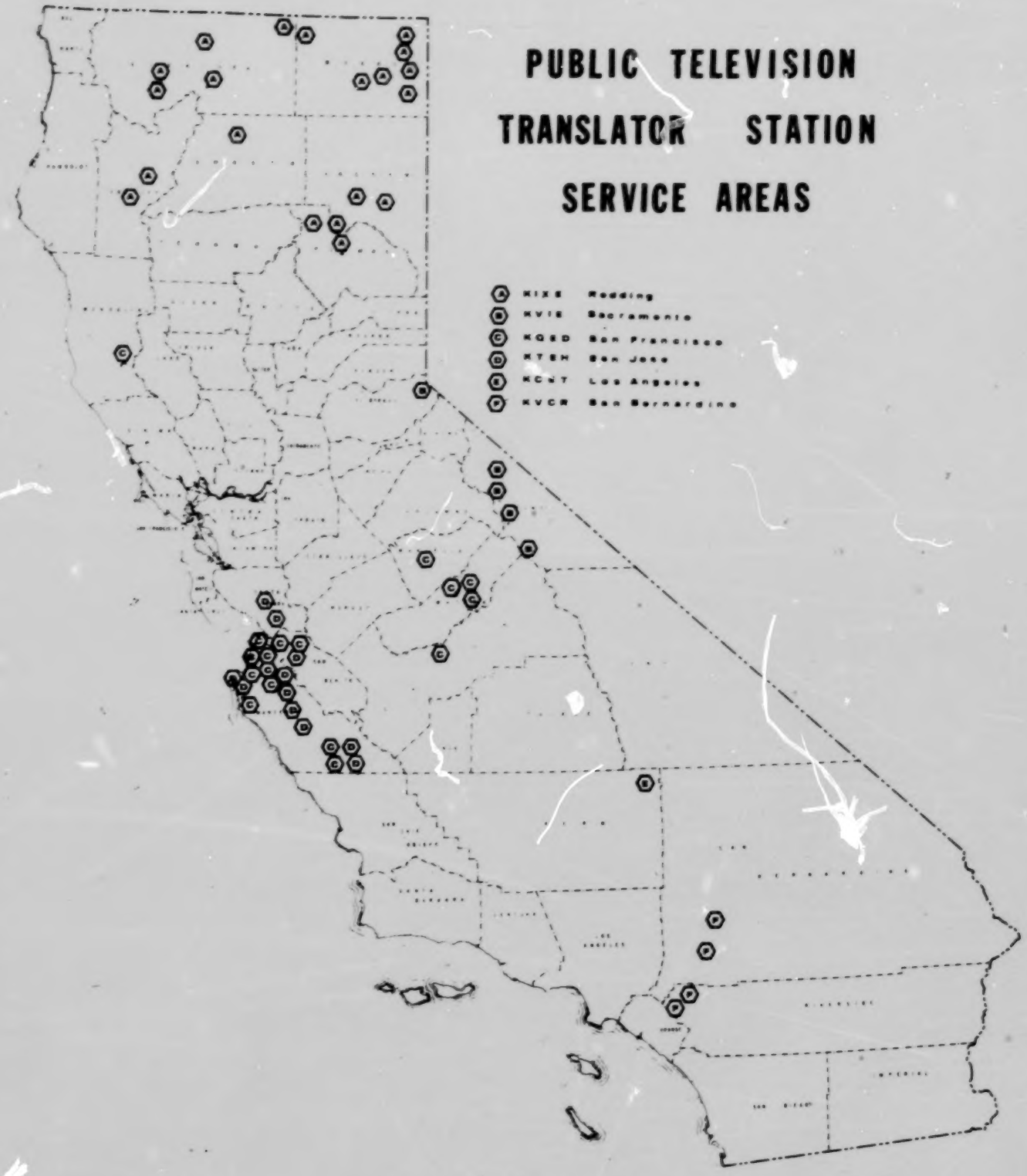
PUBLIC TELEVISION
TRANSLATOR STATION
SERVICE AREAS
KIXE Redding
KVIE Sacramento
KQED San Francisco
KTEH San Jose
KCET Los Angeles
KVCR San Bernardino

FIGURE 3

CATV AREAS
• SYSTEMS IN OPERATION
□ FRANCHISE GRANTED OR APPLICATION PENDING

Public Broadcast Stations

Station	Location	Licensee
KQED Channel 9 (1954)	San Francisco	KQED, Inc. (non-profit corporation)
KVIE Channel 6 (1959)	Sacramento	Central California ETV (non-profit corporation)
KVCR Channel 24 (1964)	San Bernardino	Community Television of Southern California (non-profit corporation)
KCET Channel 28 (1964)	Los Angeles	Community TV of Southern California (non-profit corporation)
KIXE Channel 9 (1964)	Redding	Northern California ETV Assoc., Inc. (non-profit corporation)
KCSM Channel 14 (1964)	San Mateo	San Mateo Community College District
KTEH Channel 54 (1964)	San Jose	Board of Education, County of Santa Clara
KPBS Channel 15 (1967)	San Diego	San Diego State University
KEET Channel 13 (1969)	Eureka	Redwood Empire ETV, Inc. (non-profit corporation)
KOCE Channel 50 (1972)	Huntington Beach	Board of Trustees, Coast Community College District
KLCS Channel 58 (1973)	Los Angeles	Los Angeles Unified School District
KVST Channel 68 (1974)	Los Angeles	Viewer-Sponsored Television Foundation (non-profit corporation)

Telecommunications and the Public Interest,* "From June 1973, through June 1974, the 11 stations carried a total of about 72 postsecondary telecourses, representing a total of 1,769 separate programs, not including repeats." We concur with the finding of the above report that California's public stations represent the most immediately viable delivery system for statewide educational programming. Working with California's regional instructional television consortia or independent colleges and universities, the public television stations produced more than half of all videotaped postsecondary courses created in the state. (Well over 50 program sequences have been produced in California since 1969, and many sequences contain more than 30 separate programs.) As argued in Telecommunications and the Public Interest, public television stations clearly represent a valuable educational resource, underutilized and inadequately protected.

Regional Television Consortia

Since the fall of 1970, the number of California postsecondary educational institutions participating in regional television consortia has increased from 18 to more than 80. Consortia which have already been formed include: the Los Angeles Consortium for Community College Television, with a

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*A Report of the Joint Committee on Telecommunications, California State Legislature, December 1974.

membership of 33 institutions; the Television Consortium for Valley Colleges (Community Colleges), with a membership of 8; the California Instructional Television Consortium, which includes the 19 state universities and colleges; the San Francisco Consortium, including seven member institutions; and the Outreach Consortium, a fully intersegmental affiliation of 19 member institutions.

The purpose of these consortia, as typically stated, is to extend the instructional services of schools through television to persons off campus. Affiliations of institutions allow resources, such as production facilities, to be shared. Additionally, consortia have been more successful than individual institutions in securing funds for instructional television.

A representative example of consortium activities was the production in the spring of 1973 of a videotape course entitled, "Health, Poverty, and Public Policy." The course was offered by two schools, Chico and Humboldt State Universities (then members of the Northern California Regional Consortium which later became part of the California Instructional Television Consortium in the spring of 1974). The course development was partially financed with federal funds. It was broadcast by two non-commercial stations, KIXE and KEET.

Some of the ITV broadcasts with the largest "for credit" enrollments have been "Family Risk Management,"

sponsored by 50 community colleges with an enrollment of 5,830; and "Environmental Impact Reporting and Evaluation," sponsored by 18 CSUC institutions, five UC campuses, and two independent colleges, with an enrollment of 419. In 1973-1974, over 30,000 students were enrolled for credit in 43 broadcast ITV courses. The number of students who actually followed the courses without enrolling for credit might be estimated as 10 times as great. For example, one course with an official enrollment of 18 sold over 1,300 study guides. Another course with an enrollment of 13 sold 433 study guides.

Characteristics of the Students Enrolled in Television Courses

Although complete data on the student clients for all the television courses are not available at the present time, data were obtained from a sample of 25 colleges offering television-based courses. From this group it appears that the majority of students are women, married, have children under the age of 12, and typically (77%) work an eight-hour day apart from their work as students. Most of the men are receiving veteran's benefits. When the "holding rate" of these non-conventionally delivered courses is compared with similar campus-based courses, it has been found that 20% more of the media students "drop out" before finishing the course. The media students, however, tend to

be from different populations than those enrolled in conventional courses. In a study completed by the Los Angeles Community College District regarding the student population enrolled in their television courses in the fall of 1973, it was found that of the 1,500+ students enrolled during that semester, 65% were "unduplicated" students, not enrolled in any of the colleges in the community.

Recommendations of Previous California ITV Investigations

No other area of media and technology for postsecondary education has received as much attention at the state level as instructional television. Since 1960, the state Legislature, the federal government and a number of foundations have funded ITV studies. We do not wish to duplicate the efforts of previous investigators. Instead, we will indicate what we consider to be the most important findings of these studies for the future of instructional television in California postsecondary education.*

The studies of ITV use in California have come to very similar conclusions. Some of the most important are:

1) Although existing postsecondary segments have acquired a great deal of ITV equipment, it is not being used efficiently or effectively.

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*Much of the information for this section is derived from a draft copy of an ITV study by Dale Heckman.

2) There is no existing statewide plan for the development or utilization of existing ITV facilities (at the postsecondary level) despite a number of specific requests and recommendations for such a plan.

3) When ITV is incorporated into a system of developing, delivering, and assessing instruction (i.e., total learning systems), substantial cost savings may be realized.

4) Although many community colleges, colleges, and universities have coordinated plans for the development of broadcast television, there is no statutory regulation of the nontraditional postsecondary programs which are increasing in number throughout California.

5) Existing studies indicate that ITV can most efficiently be used in lower division (large enrollment) courses and in professional (continuing) education.

6) ITV is most efficiently used on a regional basis rather than by a single institution or a single segment of higher education.

7) The most immediate barrier to successful ITV programming at the postsecondary level (other than a

master plan) is the availability of prepared programs and supplementary materials (software). The hardware (television cameras, studios, videotape recorders, etc.) is available or could be made available with a minimum expenditure of funds.

8) Project Outreach (San Diego and Orange counties) is the only attempt in the state to link both two and four-year institutions in an ITV postsecondary consortium.

9) It may be unrealistic to expect commercial producers to provide ITV programming. They have three main problems that have proved difficult to overcome: (a) different credit granting procedures by different segments and institutions; (b) acceptance by faculty groups; and (c) availability of recognized scholars to devote the time necessary to ITV productions.

10) California's ITV offerings are fragmented and tend to consist of single programs or single courses.

11) State-supported postsecondary institutions presently own six ITV studios capable of producing commercially acceptable video programs. Five others could produce broadcast quality programs with a total investment of under $1 million.

12) There is no existing inventory of television equipment owned by California postsecondary institutions. Informal reports from faculty members at various sites indicate that there is a great deal of equipment duplication between departments within two and four-year institutions. For example, in one institution it was reported that 13 different departments had acquired television equipment and were hiring staff for each of the units.

13) The different fee structures for ITV and regular segmental course offerings may prevent ITV students from enrolling in regular course programs at two and four-year institutions, and similarly, traditional postsecondary students may be prevented from enrolling in ITV courses.

14) Although educational research indicates that "high production standards" (professionally produced, color, high-quality ITV) do not necessarily increase learning, those same standards may increase the saleability of postsecondary programs to other states. A market is likely to exist for a number of years which demands both academic and technical excellence for sales.

15) Any master plan for California postsecondary education should seriously consider previous proposals

to interconnect existing ITV facilities through microwave and/or satellite. These electronic means of exchanging programming between production and delivery sites are, in most cases, more economical and effective than cable interconnections over extended distances.

Instructional Television Fixed Services (ITFS)

ITFS, not available to home users, is also growing in the state. Currently, Stanford, the University of Southern California, and the University of California at Davis are making appreciable instructional use of this closed circuit delivery device. Between Stanford and USC, approximately 8,000 employees in 20 California industries are receiving continuing postsecondary professional education via microwave television. These projects enjoy the cooperation of participating businesses, nearly zero attrition rates and very low relative costs. Stanford University is currently operating its system on a cost recovery basis.

There is considerable evidence that the federally regulated ITFS system is not being used to its full educational potential in the state of California. The report of the California Joint Committee on Telecommunications (December 1974) indicated that a number of the very limited ITFS channels in the state were being used for point-to-point communications contrary to federal regulations.

One of the mechanical advantages of ITFS is its two-way capability. Students in remote locations can communicate with television teachers via voice to ask questions or via keyboard to respond to test questions.

Since ITFS is a relatively new phenomenon and potentially important for making interconnections between the various production and delivery sites in the state we turn now to a description of the system history and operation and examples of its successful use in non-traditional post-secondary education.

In 1963 the FCC allocated 31 channels in the 2500-2686 MHz band for Instructional Television Fixed Service (ITFS). The FCC defines this service as a "fixed station operated by an educational orgarization and used primarily for the transmission of visual and aural instruction, cultural and other types of educational material to one or more fixed receiving locations." It is the point-to-point nature of fixed transmission and reception stations which differentiate ITFS from broadcast television.

The Equipment

The equipment comprising an ITFS system can be divided into three categories: program originating equipment, transmitting equipment, and receiving equipment.*

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*Some of the ITFS descriptive material was taken from Product Report #31 of the Educational Products Information Exchange (EPIE) dated 1975.

Program operating equipment. The program operating equipment used in ITFS systems is identical to that required for broadcast or closed-circuit systems. Studio equipment includes cameras, switchers, monitors, audio equipment, lighting equipment, test instruments, film chains, projectors, video tape recorders, and related hardware. The amount and kind of studio equipment are determined by the requirements of the individual system.

Transmitting equipment. Transmitting equipment includes both the transmitter itself and the transmission antenna. The transmitter is a low power device limited by FCC regulations to 10 watts (low, for example, compared to some AM radio stations transmitting at 100,000 watts), which generates a signal within the 2500-2690 MHz frequency range and then "superimposes" on this signal the audio and video signals which originate in the studio. This composite signal is sent by cable or microwave link from the transmitter to the antenna.

The transmitting antenna may be highly directional (beaming a narrowly-focused transmission at a particular geographic location), omnidirectional (transmitting a signal of equal strength in all directions), or designed to direct the transmitted signal in any of the multitude of possible ways which lie between these two extremes. For any application the antenna is designed to transmit a signal patterned

to match the characteristics of the geographical area to be covered. While the low power output of the transmitter makes possible the use of the same transmission frequencies in adjacent geographical areas without serious interference effects, the directional nature of the antenna, in nearly all cases, allows the concentration of power from the transmitter into desired vertical and horizontal planes, thereby increasing the effective radiated power of the transmitter output. A single ITFS license allows the licensee to operate four transmitters on four channels. The outputs from the multiple transmitters are typically multiplexed for transmission from a single antenna.

Receiving equipment. Receiving equipment can be subdivided into four categories: receiving antenna, converter, internal distribution system, and classroom receiver.

Receiving antennas in ITFS systems are typically installed on the rooftops at each of the receiving stations. Like the transmission antennas they are nearly always directional and are aligned to maximize their sensitivity to the transmitted signal. In addition, they are designed only to be responsive over the narrow bandwidth of the ITFS transmission so that they exclude unwanted signals.

The converter serves to translate the ITFS microwave transmission into "highband VHF frequencies" which standard television sets are sensitive to. The sole purpose of the

converter is to perform this translation which usually allows the four ITFS channels to be received on channels 7, 9, 11 and 13 of the VHF television band.

Internal distribution systems are the means by which signals translated by the converter are carried to the television classrooms. The distribution system ties receiving sets to the converter with coaxial cable capable of carrying all four channels. In large installations unity gain and pulse distribution amplifiers maintain a signal level of suitable intensity for any number of receiving sets.

Classroom receivers in ITFS systems are typically standard television sets. In installations which have the capability of "talkback," allowing students to transmit their responses to live presentations through a feedback system, which is essentially another ITFS system transmitting in the reverse direction, television sets occasionally are modified to incorporate push-to-talk microphones.

System Characteristics

One of the most important characteristics of ITFS delivery systems is that they are, in a manner of speaking, closed systems. Both the transmission and reception facilities are in the hands of the users. It is as if the delivery system is a substitute for a number of two-way cables between the program originator and the program receivers. This has both advantages and disadvantages.

A basic advantage is that the institution which is licensed to transmit instructional programs via ITFS is able to exercise control over which institutions receive the programming. This is accomplished, on the one hand, because the disseminating institution is able to direct the transmission through antenna position and design so that only in certain geographical regions will the signal be present at great enough intensity to be received. On the other hand, it is relatively unlikely that a potential receiving institution would attempt to design and install receiving equipment without cooperating with the disseminating institution, for the purpose of receiving the transmissions covertly (if the potential receiving institution is, in fact, within an area where the transmitted signal is strong enough to receive). This control is an obvious advantage where the disseminating institution requires that receiving institutions share the cost of the service, as is the case where tuition is required for participation in courses. ITFS therefore overcomes what has been a central problem for instructional television systems utilizing broadcast-based delivery systems -- the problem of an auditing but non-paying audience.

Inherent in ITFS type point-to-point transmission systems is a disadvantage also. Unlike broadcast television which is able to saturate a broad geographic region with an intense signal often reaching millions of potential viewers,

ITFS can reach many fewer potential recipients. In cases where the primary funding for the system is derived from receiving institutions, limitations of the number of receiving institutions also limit potential revenue. A (if not the) major variable cost in instructional television is the cost of production. Because ITFS systems operations cannot distribute costs over very large numbers of participants, they typically are forced to limit production investments to the bare necessities.

Instructional Television Facilities of the Stanford Instructional Television Network (SITN)

The Stanford Instructional Television Network is an ITFS-based system which delivers instruction to network participants in the San Francisco Bay Area. The instructional transmissions originate on the Stanford campus in one of four studio classrooms. These rooms are designed so that conventional lecture-type class sessions can be held for on-campus students while, at the same time, being televised for remote students.

The design of the television classrooms minimizes the extent to which the technical process of transmitting the proceedings interferes with what is otherwise a typical large group lecture at Stanford University. The classrooms are equipped with two television cameras. One is mounted vertically over the podium where the instructor stands, the

other is located at the back of the classroom and is directed towards the instructor. The vertically-mounted camera functions as a blackboard would in a conventional classroom. It is focused upon a note pad on which the instructor may write, and will also allow the instructor to use previously drawn charts and graphs, previously constructed models, or text materials from other sources. The camera at the back of the room is used to view the instructor. A microphone mounted on the instructor's podium feeds into the audio transmission system.

In each of the studio classrooms every two students share a television monitor which is equipped with a push-to-talk microphone. Questions generated by students in the studio classrooms are communicated via these microphones, not only to the instructor, but to remote students at participating institutions.

A control room behind the classrooms houses equipment operated by a technician during class sessions. The technician remotely controls the cameras located in the classrooms and is able to cause the cameras to pan, tilt, zoom and focus in order to follow the instructor or a demonstration during an instructional session. In addition, the technician sets the audio levels for the instructor and the students and chooses the images which are to be displayed on the studio classroom monitors and transmitted to the remote classrooms. The choice of shots is typically a single shot of the

instructor, a shot of the note pad, or a split screen combining both.

The video and the audio signals are carried from this control room to a master control room where they are simultaneously videotaped, routed back to the television classroom for display on student monitors, and transmitted by microwave to an antenna installation on the top of Black Mountain located in the coastal mountains a few miles to the southwest of Stanford. An engineer in the master control room can also insert pretaped segments into a transmitted program although it is rarely done.

Located at the antenna installation on Black Mountain are five transmission antennas. One transmits a signal which covers a 160 degree arc and extends 25 miles in a northeastern direction. This antenna is driven by 6.5 of the 10 watts permitted by the FCC. Four more narrowly-focused beams, transmitted from four other antennas, are directed towards the Mission District in San Francisco, Point Richmond, north of Berkeley, Mt. Diablo, and the University of California in Berkeley. Although three of these locations are 35 to 40 miles away they can be reached with the remaining 3.5 watts because of the dish-type antennas which are used. Lawrence Livermore Laboratory maintains a repeater station on Mt. Diablo which retransmits the SITN signal to Livermore. Also located on Black Mountain is an antenna to

receive talkback transmission from participating institutions.

Each Stanford Instructional Television Network member is responsible for installing the requisite receiving equipment. As discussed earlier, this includes a rooftop antenna, a converter, cabling, and classroom-located television receiving sets. Many sites provide four separate remote television classrooms so that students enrolled in any one of the four possible simultaneously broadcast classes may be segregated from, and therefore not interfere with, students enrolled in any of the other three courses. As in the Stanford campus television classrooms, the typical remote classroom is equipped with sufficient television monitors and talkback facilities, although member institutions may choose not to install the talkback equipment.

ITFS at the University of Southern California

In 1972, the University of Southern California Interactive Instructional Television System began televising courses to business and industry in the greater Los Angeles area. The USC network may be the most technically sophisticated and most highly developed of the ITFS systems. The network is a four-channel one-way video, two-way audio ITFS system with an FM radio link allowing talkback.

Through the interactive television system, students can work on undergraduate or advanced degrees, take part in

continuing education studies, and receive short seminars or other information services while remaining on or near their place of work.

The system is centered around the Norman Topping Instructional Television Center on the campus of USC. In this building, which was constructed with an $825,000 gift from the Olin Foundation, are located four studio classrooms with their respective operators' booths at the rear of each room and the master control room, which is the coordination center for all the classrooms and the entire delivery system. The on-campus studio classrooms and control facilities, plus the master control center function in essentially the same way as the Stanford Instructional Television Network. The major difference is that the USC system uses three cameras, rather than two as in Stanford's case. The front camera which focuses in on the students is the additional camera.

From the control booth an operator can choose the picture from the overhead camera, which is employed when the instructor uses the desk pad rather than the blackboard; the rear camera, which pictures the instructor before his or her class; or the front camera. Or, two pictures may be presented simultaneously to show a split screen image. As in the case of the Stanford classrooms, every two students share a television monitor with appropriate talkback facilities. The network can also broadcast from an auditorium,

which is equipped like the studio classroom. Thus, larger conferences or seminars may be televised to the off-campus classrooms.

Master control also functions to provide guidance to each of the studio classroom operators, insure the quality of the signal to both the studio classroom and to the receiving sites off the campus, and channel the four different courses being televised to the correct satellite rooms on campus or to the Seaver Conference Center. The signal from the studio classrooms is beamed to the Mount Lee transmitter where the signal is rebroadcast over the Los Angeles community for 30 miles in all directions. Receiving sites in the reception area pick up the signal and convert it to the VHF-UHF band where the picture can then be displayed on television monitors. The necessary receiving and talkback equipment, plus classroom(s) are furnished by the individual company or firm.

By 1975, many companies and firms have receiving sites. There is also a receiving location at Rolling Hills High School which is used on an experimental basis and another regional receiving site located in the heavily industrialized El Segundo area. The Information Science Institute at Marina del Rey will be added to the network in the very near future, also.

The Hughes Aircraft Company, Aerospace Corporation,and Burroughs, located respectively at Culver City, El Segundo,

and East Pasadena, are equipped with receiving classrooms to pick up broadcasts. The present two-classroom facility at Hughes Aircraft will soon be expanded to bring live lectures to several classrooms and also to enable videotaped programs to be patched into five separate study carrels for students who have missed a lecture. Aerospace Corporation with its four receiving classrooms and wired auditorium shares its facilities with the Air Force Space and Missile System Organization in receiving broadcasts. The Burroughs Company has a two-classroom facility that is shared with the Bell and Howell Company. In February 1974, Jet Propulsion Laboratory in Pasadena and Van Nuys' ITT-Gilfillian were added to the USC system.

With the aid of a $99,500 National Science Foundation grant, USC has established a regional four-classroom receiving site in the El Segundo area. The purpose of the regional site is to enable companies that would like to participate in the network the opportunity to do so at a reduced cost. Students attending the regional sites must travel a short distance to the receiving location, but it is a much shorter distance than driving to the campus of the University of Southern California. In the near future, a second site will also be chosen for locating another regional classroom facility. Although the regional classroom application has yet to be evaluated, its success or failure may influence the future development of the overall network.

The Rolling Hills High School receiving site is involved in an experimental program concerned with high school and university interaction. The system is primarily used to teach computer programming to high school students and is infrequently used for supplementary lectures from USC instructors to students.

The Information Science Institute which serves as a research branch of the engineering school in computer science will also be equipped with receiving classrooms and originating facilities. Staff members and students working at the Institute will be able to originate televised courses. Students in the near proximity of Marina del Rey will also be able to take televised courses from the ISI facilities. In time, the USC medical campus and the Marine Science Center at Santa Catalina Island will be added to the network.

Presently, the USC system is offering only about 30 courses a semester, including a non-credit calculus refresher course for high school teachers. If the system were used from 7:00 a.m. until 8:00 p.m. weekdays, it would be possible to televise at least 80 three-credit courses each semester.

It is possible to become a member of the USC network in either of two capacities. In one capacity, the organization is simply allowed to take part in short seminars or participate in USC televised courses on an "audit only" basis. In

the other capacity, a company or firm takes part as a fully participating member.

The complete participation option's membership fee, like the Stanford network, varies with regard to the gross annual sales of the company or its number of employees. In USC's case, the smallest company pays only $15 per month, while the largest pays $475 per month, or approximately $180 and $5,700, respectively, on an annual basis.

Each company pays for its own receiving equipment and facilities, which costs in the range of $6,450 for a single classroom with talkback facilities to about $9,700 for the four classrooms with talkback equipment. For companies that merely participate as an auditor, rather than as a full member, no talkback equipment is required, and costs for the classroom may be as low as $1,500. It is also possible for a company taking either option to lease the necessary facilities on a monthly basis.

What the off-campus student and company pay in tuition varies with the student's status. A degree-seeking student pays the same tuition as a traditional student plus an additional $20 television charge. A non-degree-seeking student pays about one-fourth the tuition that a degree-seeker does and the $20 television charge. An auditor merely pays the non-degree student's tuition and no television fee. In most cases the television fee is paid by the company. Although the limit was not stated, there is a ceiling limit which the

total television fee of $20 per student may not exceed. During the second semester of operation, some 150 students were registered in television courses.

The network has been in operation since 1972; the future goals for the USC Interactive Instructional Television System are to incorporate more industries, organizations, and agencies into the system. Junior colleges and high schools will also be brought into the system where USC can meaningfully contribute to the educational goals of those institutions.

The USC system plans to increase the programming schedule and develop more programs in the science and engineering areas and broaden the scope of the televised courses to include the business and management fields.

The University of California/Davis Instructional Television System*

Since its initiation around 1972, the University of California at Davis has been operating a microwave television system between the Davis campus near Sacramento and the Livermore site approximately 60 airline miles distance.

From the Davis campus, a microwave dish antenna broadcasts a microwave signal to the Mt. Diablo tower where the

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*A discussion of the University of California's use of this delivery system can be found in Marcia Salner's report, Postsecondary Educational Alternatives in California: An Inventory of Information About Existing Services.

signal is amplified and rebroadcast to the Lawrence Livermore Laboratory facilities and to Livermore's Sandia Laboratory. As the system is set up, there is one-way video, two-way audio from each direction. The transmission path from Livermore to the Davis site also goes through the Mt. Diablo tower and then terminates at Davis. Thus, students at both sites can simultaneously be receiving courses, or courses can be simultaneously transmitted from either site.

The Livermore site receives about 30 graduate courses each year in the engineering and applied sciences and also transmits 12 courses annually. The engineering sciences are primarily in the fields of electrical, civil, and mechanical engineering. In the near future, it also appears likely that Livermore will originate courses in the computer sciences area.

The courses are originated from studio classrooms which are equipped with a single manually operated rear camera. The camera is controlled from a booth at the back of the classroom. The only other modifications to the classroom are television monitors for the students, a speaker which enables remote comments to be heard by the local section, and a blackboard mounted on a glare-treated wall. The cost for the room modification is estimated at about $15,000.

At the receiving facilities each two students share a television monitor. When more than one course is being transmitted at the same time, students located in the same

receiving classroom wear headphones, rather than listen to a loudspeaker, so that the correct audio accompanies the correct video component.

Among one of the unique features of the UC/Davis system is the use of an overhead camera at the Livermore receiving facility. The camera in conjunction with two-way audio enables a student's work to be shown and discussed with an instructor at Davis. Some dozen instructors' offices actually have individual monitors set up for this purpose.

In 1973, the UC/Davis network was being extended to the greater Sacramento area to reach industrial organizations and a Sacramento teaching hospital. The UC/Davis system, in addition to the microwave link, has an ITFS system that reaches into the Sacramento area.

Videotape

Videotape should properly be considered only part of an instructional delivery system. The rest of the videotape delivery system is typically composed of couriers or postal letter carriers who deliver the videotapes to a site, and videotape playback machines and television monitors which enable the user to view the tapes.

The Telelibrary of the Consumnes River College is an illustration of the successful use of videotapes in California postsecondary education.

The Telelibrary

Funded by a federal Title I grant to the Los Rios Community College District, this system utilizes the public libraries as outreach centers. Television video cassette machines and monitors are placed in 10 libraries and six community colleges over an area of 2,600 square miles. People are invited to the telelibrary stations to view non-credit programs for the aging and (eventually) for women, the disadvantaged, minorities, parent/child relationships, and consumer problems. During the first year (September 1974 to December 1975) 3,500 California residents viewed 43 half-hour programs. After its initial year, if additional funds are received, the system plans to expand the number of participating libraries, increase the number of programs available, and offer courses for college credit.

The Telelibrary benefits from one of the advantages of videotaped instruction. The users of the tapes are free to schedule their viewing at their own convenience (within the constraints of the library schedule). Most delivery systems which transmit information at a given time require that users conform to the transmission schedule. The use of videotapes in this way, however, becomes less cost-effective as the number of different programs and the number of locations to which the tapes must be delivered increases. Mailing costs, costs of videotape playback decks, and costs of

the videotape itself compound quickly with many programs and/or many delivery locations. Additionally, it is often impractical to make use of existing videotape playback decks in assembling a Telelibrary-like system due to the incompatibility of equipment produced by the video industry. It is likely that most of the equipment in such a system would have to be purchased for the development of the system.

Computer-Assisted Instruction (CAI)

Comstock (1972) reviewed the instructional uses of computers in California postsecondary educational institutions. He found that although 93% of all state institutions had access to computers for data processing, only 68% were making instructional use of the device. Of that 68%, 90% were using the computer to teach computer programming, 33% for simulations and instructional games, and only 10% of the institutions reported using the computer as a medium to present instruction directly to the student. Comstock also reported that the use of the computer as an instructional device had not changed appreciably in the five years preceding the report.

The sharing of computer facilities for tutorial and instructional simulation use is very popular in the state. More than half of all the public and private colleges use shared facilities. The trend, however, is for the doctorate

granting institutions to use dedicated (i.e., exclusive) facilities, and for the state universities and community colleges to share.

Approximately 150,000 California higher education students are currently involved in approximately 3,700 computer based courses. The largest proportion (90+%) of these were in public institutions and about 50% are located in community colleges. The largest percentage of students are in semi-professional, technical, and occupational training programs. Many of them are training for careers associated with or requiring data processing skills. Computer programming, engineering, the sciences, social sciences and teacher preparation account for the majority of the students using the computer as an instructional device.

One of the major problems of this area is the duplication of software or computer courseware. The trend toward the sharing of physical facilities is not paralleled by the sharing of courseware. Many institutions have a tendency to write their own courseware without undertaking a thorough search for similar and useable existing programs. Those who use the device for computation make extensive use of "canned" or existing software. It appears that the long-standing higher education tradition of individual instructor control over specific courses leads to this often unnecessary duplication of effort. Comstock (1972) estimated that only a minor proportion of instructional computer programs were

obtained through sharing with other institutions or by purchase from publishers. The sharing of computer facilities does not seem to guarantee efficient utilization of instructional materials.

Factors Affecting Computer Use in Instruction

Comstock (1972), in a survey of over 200 California higher education institutions found that administrator and student attitudes toward the computer stimulated its use while (predictably) lack of funds was cited most frequently as an inhibitor of use. It was also the concern that faculty would be untrained to write computer courseware, that the computer programming would be unavailable (by royalty, purchase or sharing),and that faculty (especially senior professors) would hold negative views toward its use in instruction.

The PLATO IV System

The PLATO IV System is a computer-assisted instructional system which has been developed at the University of Illinois at Champaign/Urbana by the Computer-Based Educational Research Laboratory. The system allows users at participating institutions throughout the country to access instructional courseware which is stored in a central computer at the University of Illinois. A new and sophisticated terminal capable of extremely clear graphic displays of data transmitted

over ordinary telephone lines has been perfected. Since system development was initiated in 1971, more than 500 authors have produced over 2,000 hours of lesson material. The PLATO System represents the kind of CAI system which might be developed in California in order to accomplish a multitude of non-traditional postsecondary educational tasks. Features of CAI systems such as their capability of presenting instruction, diagnosing responses, and indicating whether a particular user has mastered a body of material at some pre-set level of competency make them especially appropriate for certain educational applications. For example, training or retraining of professionals requiring relicensure but for whom attendance at traditional classes imposes an excessive personal and social cost might be accomplished using CAI. Doctors, lawyers, family counselors, etc., might take advantage of CAI terminals located conveniently and accessible easily to maintain proficiency in each of their changing fields.

A number of California's postsecondary institutions have participated or are currently participating in the PLATO System.

Seven PLATO terminals are located at the University of Southern California. Four of these are used by the College of Medicine which is developing its own courseware for classroom or independent student use. Three other terminals are located at the Department of Information Sciences where they

are being used in a research project aimed at developing data transmission systems which will reduce the cost of renting telephone lines now used to link remote terminals to the central facility in Illinois. One of the most promising possibilities for such linkages is the use of communications satellites.

The California Institute of Technology is currently involved in the development of hardware which would standardize the interconnection of PLATO terminals (now produced commercially by a corporation in Los Angeles) and computers other than that at the University of Illinois. Some of the characteristics of the terminal are especially attractive for reduced cost, high-quality CAI. Among these are its capability of animating objects on a television-like screen, its competitive cost relative to other computer terminals, and its capability of storing 2 x 2 transparencies within the terminal which can be projected at the appropriate time during a lesson reducing the cost associated with the transmission of the data required to produce the picture.

Other California institutions which have participated in the PLATO System are Stanford University, the University of California at Los Angeles, the University of California at Santa Barbara, and the Department of the Navy at San Diego.

The Educational Telephone Network

The Los Angeles Community College District provides a delivery system for instruction that utilizes the telephone. Instruction is relayed by a phone from a "master classroom" to locations such as businesses, government buildings, libraries (etc.) that are more accessible to students. Two-way voice communications are possible between instructors and the students. From the spring of 1974 to the spring of 1975, 28 courses were offered to approximately 1,200 students. Most of the courses were in business administration and law, with a few offerings in Spanish, biology and philosophy.

Audiovisual and Programmed Teaching

During the spring of 1975, approximately 30% of the community colleges and 25% of the state universities used self-administered audiovisual instructional programs. The heaviest concentration of this type of instruction is in the northern part of the state. Although very little information is available on student enrollments, attrition rates, or course content, it is our impression that the approach is growing in attractiveness. Basically, students work at special desks in libraries or study areas with a slide projector, an audio tape playback machine and/or printed texts. They are allowed to proceed through the materials to be learned at their own rate. The examinations are usually

contained in the text and may be scored by non-professional staff, although there is always an "instructor of record" or instructional aid available for consultation by the student.

Programmed learning is similar to audiovisual instruction except that only a specially prepared printed text is used. Instruction is provided in a step-by-step fashion with many self-administered tests so that students receive constant feedback about their performance. No special training facilities are necessary and these texts may be sent through the mail or purchased in local bookstores if necessary. Many university and college extension courses employ this method of instruction. Since students are given instruction in short sequences and have the opportunity to constantly "self-check" their program for progress, the need for access to a teacher or tutor is greatly reduced.

Library-Based Independent Study Programs

Chabot College has been administering two types of independent study courses that utilize community libraries and the BART stations in the district.

A variety of home study courses are offered through community libraries by an audio cassette accompanied by printed texts and tests that can be borrowed by residents of the district. From the fall of 1974 to the winter of

1975, nine courses were offered to over 200 students. College owned and maintained audio cassette units have been placed on reserve in each of the public libraries in the system. An instructional aid (working 20 hours per week) visits each of the libraries weekly to provide assistance to the students and library staff. Enrolled students may drop in to their library any time to work on their lessons.

Another type of independent study, the commuter courses, are also administered by Chabot. These offerings are designed to attract commuters using the BART or AC transit buses in the district. All college course administration procedures including administration, registration, distribution of texts and other materials, scoring of tests and other exercises are handled in the confines of the participating BART station. An instructional aid also makes regularly scheduled bi-weekly visits to each BART station in the district to provide assistance to students and administer courses. During the autumn and winter quarters, 403 students took advantage of the commuter courses.

Instruction by Newspaper

One of the significant (but seldom explored) instructional resources is the American daily (or weekly) newspaper. It is possible to print lessons in newspapers that are routinely delivered to even the most isolated of California's

citizens. Newspaper publishers see their role as both informational and educational and they have periodically indicated interest in offering instructional sections in their papers in cooperation with existing postsecondary segments.

The University of California/San Diego Program

In 1973, the National Endowment for the Humanities funded a "matching grant" to the University of California in San Diego for two courses to be distributed free through the Coply news service. One of the courses, "America and the Future of Man" consists of twenty 1,400 word lectures written by 20 leading American scholars. More than 100 newspapers in the United States and abroad have carried the course. In consideration for receiving the "copy" for the courses at no charge the newspapers agreed to publicize the program to their readers.

Audiotape

Although audiotape technology has been available for a number of years, recent advances in this medium have made it a more desirable delivery system. The new "cassette playback" machines are relatively inexpensive (about $40 for a good machine), easy to use (i.e., with batteries or "wall socket" models) and accessible to students in their homes or in learning centers. Tapes cost approximately $1 for one half hour.

One of the distinct advantages of this device is its low cost. The initial investment is low, it is convenient for students to use, and the tapes can be erased and reused repeatedly. Maintenance on the machines tends to be low and their design permits operation by nearly everyone.

Although a number of postsecondary education agencies and institutions have made use of cassette tapes in instruction,one of the most interesting programs currently operating in California is Project Socrates.

Project Socrates

Developed over the past 10 years by a faculty member in the Psychology Department of Palomar College, Project Socrates is an example of the successful use of audiotape in college instruction. Cassette tapes replace two out of three classroom hours of instruction and are combined with printed manuals (inexpensively produced) and machine scored tests to give students immediate feedback on their test performance.

Students enrolling in the cassette-assisted courses are asked to purchase two blank cassette tapes at the college bookstore (at a cost of $2). They turn these tapes into the learning center and receive replacement tapes containing the first lessions. This process is repeated once a week for 14 weeks. A high-speed tape duplicator erases

the previous week's lessons and records the new lesson on each tape. The tapes of the last two lessons are retained by students to replace the original tapes they purchased.

In addition, students purchase a locally-printed workbook (produced at approximately one-half the cost of a commercially-prepared text) and a paperback text that is commercially-produced. The workbooks contain sample tests, instructions for reading or listening, and directions on how and where to get tutoring and/or advice when necessary. The text contains background material for the content of the course. Those students who cannot afford to purchase or borrow playback machines are allowed to use college-owned devices located in a conveniently placed learning center.

All examinations are given in large groups and are machine scored immediately (at a rate of 30 tests per minute) so that students can find out how they performed as soon as they finish. This procedure (plus the sample tests in the booklets) tends to eliminate failures by the students and greatly increases student satisfaction and motivation.

About 500 students are enrolled each semester in one course using this method, which makes it possible for one faculty member (with adequate technical assistance) to handle from 1,000 to 1,500 students per year (in large enrollment courses).

The main advantages of this approach seems to us to be:

1) The systematic way in which instruction is designed, evaluated and presented to the student;

2) The flexibility provided to the student in the teaching/learning situation;

3) The precise way in which course goals are articulated -- so that all students know exactly what is expected of them;

4) The low cost; and

5) The more efficient use of faculty time (after an initially high front-end investment in time to design a course) and instructional facilities.

The only significant disadvantages of this system seem to us to be:

1) The resistance by teachers to adopting a system which implies less teacher/student interaction and the responsibility for more students; and

2) That it seems to us to be most effective with large enrollment courses whose content does not change appreciably from year to year and where constant and close interaction with students is not necessary for learning.

Generally, we feel that the advantages far outweigh the disadvantages and that the system should be given careful consideration.

Satellite Technology

In December of 1975, the National Aeronautics and Space Administration (NASA) will launch an experimental Communications Technology Satellite (CTS). The satellite will orbit over the Western United States for approximately two years. The CTS has been designed to allow for relatively low cost linkages between television broadcasting, computers, and audio signals through microwave antennas.

Since so many of the plans for linking various resources in the state have involved costly and/or logistically difficult plans (cable links, broadcast interconnections, etc.) the satellite may eventually provide a low cost method of linking various institutions in the state through broadcast television, computer and voice signals.

The only current plan to utilize the satellite linkage during the experimental operation has been designed by the primary and secondary school system in the Archdiocese of San Francisco (Project Interchange). To our knowledge, none of the state's postsecondary institutions are making concrete plans to employ the CTS for instructional programs.

Presumably, it would be possible for the regional television consortia in the state to interconnect their facilities via the satellite. Television tapes or computer signals could be exchanged and/or broadcast simultaneously. It also makes possible the exchange of information and instructional programs with other states and systems.

The microwave equipment necessary for connection with the satellite has been vastly improved and simplified over the past four to five years so that the cost is within reason even for a relatively small institution. Although federal regulations for the use of satellites by postsecondary systems are not yet firm, we feel that this approach to interconnecting the many media and technology-based programs in the state warrants study.

The Public Service Satellite Consortium

The Public Service Satellite Consortium is an association of institutions which was formed in February of 1975 to "see that the technology demonstrated by NASA satellites becomes the basis for a permanent operational system." The consortium was initiated after a series of meetings brought together educators, health care specialists and communications experts who were excited by the early results of an array of health and education experiments now under way on NASA's ATS-6, the most powerful communications satellite ever launched. Much of the momentum for the establishment of the

consortium came from individuals in California who are active in the field of communications. The consortium members hope to generate enough demand for the services a communications satellite can provide to cover the cost of its design and launching and to make it permanently available to California and other western states. The consortium is also destined to play an influential part in the development of federal regulations regarding the public and private use of communications satellites.

Members of the consortium include:

The State of Alaska
The County of Los Angeles
Miami Dade Community College
The North Dakota Adult Educational Council
The Joint Committee on Educational Communication
The Mississippi Authority for Adult Education
The Southern Education Communications Association
KCET (a public television station in Los Angeles)
The Corporation for Public Broadcasting
The Aspen Institute
Indiana Higher Education Agency
The Western Interstate Commission
The University of Southern California
Indiana University School of Medicine
San Diego State University
National Public Radio
The American Academy of Orthopedic Surgeons
The Rocky Mountain Corporation for Public Broadcasting
The United Methodist Church
Stanford University
The Committee on Institutional Cooperation (of the "Big Ten")

Learning Resource Centers

Students, staff, and faculty in most publicly supported postsecondary campuses in California have access to a learning resources center. These centers provide a variety of instructional services ranging from routine audiovisual services at some institutions (e.g., copying slides for projection, drawing graphs and charts, duplicating audiotapes, etc.) to extensive instructional development activities at others (e.g., providing faculty with advice and assistance in the design, redesign, and assessment of courses and/or curricula, providing carrels equipped with television, audio, computers, etc. for individualized instruction projects and so on). It should be noted that only a few campus learning resource centers provide the full range of services described above.

The centers may be administered by non-faculty specialists (graphic artists, photographers, equipment repair specialists), department chairpersons, part-time faculty members who have some interest in media or instructional design, non-faculty instructional developers, directors of campus libraries, or faculty members with full-time appointments as center directors.

We have found that the interest in and commitment to learning resource centers increases dramatically as one moves from the UC system, through the state universities

and colleges,to the community colleges. Although in both the UC and the state universities and colleges there are exceptions to this rule, it has been the community colleges that have emphasized and supported the concept. One factor that may partially account for this difference is the type of student served by the community college. Since most faculty members have considerably more experience with the more traditional student in postsecondary institutions they tend to turn to learning resource professionals and facilities for assistance in designing interesting and motivating courses for the non-traditional student.

The following is an abbreviated listing of the services provided by learning resource centers at selected community colleges in the San Francisco Bay Area:

Canada College: Independent study facilities, short courses, television monitors, videotape recorders, language laboratory, facilities for administering slide/tape packages, and a career center.

Chabot College: Library independent study center including programmed instruction for regular courses, on-campus coordinated system courses, off-campus course services; closed-circuit television, printing and graphic art facilities.

Consumnes River College: Independent studies and short courses, closed-circuit color television facilities.

De Anza College: Unit includes print, instructional development, instructional research plus tutorial, career and diagnostic learning centers. Programmed instruction, short courses for instructors, color television, videotape recorders, printing and graphic arts facilities.

Diablo Valley College: Center includes listening/viewing self-instruction room with 110 carrels, individual listening/viewing rooms, an auditorium with 250 seats, production and recording control rooms for television, graphic arts, printing and computer instruction.

Foothill College: Individualized study room includes study skills tutoring, math lab and listening facilities for audiotapes. Facilities include television, local printing, graphic arts, foreign language lab and biology-physiology auto-tutorial courses.

City College of San Francisco: Independent study facilities, programmed instruction, short courses offered, computer-aided learning facilities, television, local printing.

San Jose City College: Independent study, programmed instruction, short courses, the development of learning kits. Facilities for the production of commercial television programs. Computer access to course material.

Although the learning resource center is a vital part of the community college campus, its position in the UC and CSUC systems should not be overlooked. Merrill & Drob (1974) have surveyed the activities and concerns of the centers in the UC system and conclude that:

> Use of learning resources will continue to expand during the next two decades. The majority of students and administrators now agree with the majority of the faculty that more learning resources of some nature are a necessity. Solid empirical evidence of the effectiveness of learning resources supports this opinion . . . (however) the expanding use of learning resources . . . raises problems of academic and administrative control that have . . . attracted little serious attention. (pp. 11-12)

After considering criteria for planning learning resource centers, Merrill & Drob (1974) recommend that:

1) The learning resources center should offer training in the application of improved instructional strategies to faculty members on a continuing basis.

2) Space for the learning resources center should be sufficiently convenient and attractive to encourage faculty acceptance and utilization.

3) Direct funding for the learning resources center should be available in an amount necessary to provide for equipment replacement, research and development, consultation in instructional development, group and self-instructional presentation services, and planning services as a minimum; the balance should be obtained on a fee-for-service (recharge) basis. (p. 100)

4) The director of learning resources should report to the chief academic (level two) officer of the campus. (p. 99)

5) The director of learning resources should be a professional member of the faculty, having qualified according to high standards of academic preparation as well as experience. (p. 99)

6) At least one consultant in instructional development should be employed full-time on the learning resources center staff. (p. 99)

The fragmentation of learning resource services within institutions is a problem in this area as it is in most other media and technology programs. Merrill & Drob point to a previous study indicating that on one UC campus 22 units providing some "learning resources" were operating. They also point out that the imagined benefits of centralization often turn out to be illusory but suggest that the UC system (and, we would add, the CSUC and CC systems) need a "decentralization policy," one that governs the growth of decentralized units in institutions.

The Ventura Learning Center

The Ventura Learning Center bears special mention as it is the only intersegmental learning resource center in California, It is jointly operated and funded by the University of California and the California State Colleges and University. In Postsecondary Educational Alternatives in California: Inventory of Existing Postsecondary Alternatives (1975) Marcia Salver describes the Ventury Learning Center as follows:

> The physical facilities of the Ventura Learning Center are next to a large shopping center and provide five classrooms, a resource center for individualized study (including a computer terminal) a small library, and places for academic counseling and advising. Microwave links with the UC Santa Barbara campus are being developed so that students at the Center will have two-way communication with live classes on the UC campus. Ventura Community College offers the use of its library in exchange for use of the facility.
>
> The purpose of the Ventura Learning Center is to provide a variety of learning resources for the citizens of a rapidly-growing area that is without easy access to baccalaureate and graduate degree programs. The Center has an administrative staff, but no resident faculty of its own. As of February 1975, the California State Colleges and University offered six degree programs through the Center; University of California's Extended University offered seven degree programs. Continuing Education Extension courses from both segments are offered as well.
>
> The administrative staff of the Center responds to inquiries and provides information,

referrals, and counseling about specific programs, credentialing, transcript review, admissions, etc. During the first six months of the Center's operation from August 1974 to January 1975, inquiries averaged 136 per week. In addition, the nearest campuses, CSU Northridge (about 55 miles away) and UC Santa Barbara (about 35 miles away) periodically send academic advisors to help potential students.

During the winter quarter of 1975, the following numbers of people were enrolled through the Ventura Learning Center:

Individuals enrolled in one or more degree-credit courses	367
Total enrollments in degree programs	513
Enrollments in non-degree Extension courses	540

The Ventura Learning Center expects to offer Extended University programs from any of the UC campuses, External Degree Programs from any of the CSUC campuses, University Extension courses, and CSUC Continuing Education (Extension) courses. These programs will be coordinated with the Ventura Community College District.

III. INSTRUCTIONAL TECHNOLOGY-BASED POSTSECONDARY EDUCATION: FOUR CASE STUDIES

The British Open University, the State University of Nebraska/University of Mid-America, the Free University of Iran, and the Chicago Television College are postsecondary educational institutions which may serve, in several respects, as models for those educational planners investigating the systematic use of media in instruction. We have selected these four institutions for discussion because, in planning or in practice, they have dealt with concerns which we consider to be of great importance in the operation of media-based educational systems in California.

These concerns include:

1) The creation of institutional mechanisms to ensure responsiveness to changing student needs, especially difficult in mediated systems where faculty/student contact is often greatly reduced.

2) The design and production of supplementary materials necessary to adapt courseware for local use.

3) The development of efficient procedures for the design of effective courseware.

4) The implementation of practices which allow faculty to accommodate differences in student learning preferences and styles.

5) The determination of instructional objectives for each course offered and the evaluation of materials developed or purchased to accomplish those objectives.

6) The evaluation of instructional delivery system alternatives and the choice of the most appropriate system for a particular instructional task.

The British Open University (BOU)

In California, most media-based higher education programs are located in existing postsecondary segments. In other nations, however, efforts to increase the accessibility of higher education have often led to the organization of new and independent systems. Of those new programs, ". . . the Open University (in Great Britain) represents the most ambitious effort yet known to harness the potential of radio and television, wed them to a system of independent study, and organize the program as a formal degree granting operation" (Hartnett, et al., 1974, p. 7). Both survey and upper level courses are produced and broadcast by a cooperative arrangement between the Open University and the public-owned British Broadcasting Corporation (BBC). Instructional workbooks are sent by mail to students who twice a week return written assignments and exams by mail to "Correspondence Tutors" for comments and evaluation.

Neighborhood study centers are available to students for additional resource materials and personal assistance by tutors.

Beginning in 1971 the Open University (OU) admitted all applicants over 21 years of age to a trial period of coursework. Initially, students are asked to try a course or two for three months to see if higher education fits into their work, social, and/or family commitments. During this provisional period the student pays a minimal ($24) registration fee per course. If coursework progresses satisfactorily and fits into the students' work routine, they are invited to enroll in a degree program and pay additional registration fees. The OU staff expends a great deal of effort during this period to give support, counseling, and feedback to new students in order to provide every opportunity for success. Over the past four years of operation this approach has tended to cut excessive long-term losses from student attrition. All courses are offered in a 40-week academic year beginning in January and concluding with a three-hour comprehensive exam in November. An intensive one-week on-campus summer school session is offered to all students.

Course Production

One of the most time-consuming efforts by Open University faculty is the production of course materials. For each

course,the staff produces correspondence unit booklets that carry eight instructional tasks. These booklets are usually designed in a step-by-step programmed learning fashion. They are supplemented by laboratory equipment (for science courses), tutor and computer graded tests and assessments, study guides, instructions for home experiments, self-assessment tests and exercises, broadcast notes (to supplement radio and television programs) and "Set Books." The Set Books are commercially available texts considered to be "Foundation" or "Basic" works in the field. The Open University faculty attempts to select paperback versions of these books to minimize student investments.

Most of these materials are developed by a team consisting of instructors, educational technologists (instructional design and evaluation specialists), and media producers (writers, television and audio producers). This model was successfully used in this country by Children's Television Workshop (the producers of Sesame Street).

Television and Radio

The broadcast segments of the Open University curriculum have attracted a great deal of attention and interest in this country. However, many American educators assume that they are the primary vehicle of the Open University program and are surprised to learn that their British

colleagues consider the broadcast series to be merely a supplement to the printed correspondence package.

Most broadcast segments are presented once each week and provide a combination of course-related materials and general announcements about activities of the university in general. The amount of effort expended on the content of the broadcast is approximately the same for all courses. The effort expended on the television or radio productions themselves, however, varies considerably. The televised presentations range from "the talking face" (essentially a televised lecture) to expensively produced segments (many visuals, motion film inserts, careful scripting, use of actors). Open University faculty members are divided in their opinions about the usefulness of broadcast segments. But a majority consider them very useful, and a third feel that they should be increased in number. The student attitudes toward these segments are overwhelmingly favorable. When the attitudes of traditional students (enrolled in both OU and traditional higher education institutions) and non-traditional students (enrolled in OU only) are compared, an interesting difference results: Although the same percentage of both groups indicate that they thought the television programs are very important (53%) or important (35%), they find them useful at different stages in the development of a course. Traditional students find television most useful during the beginning stages of a course and think that

their importance diminishes over time. The reverse trend is true for the non-traditional students. They believe the usefulness of the television series increases over time. The difference between these two groups may provide insights for future media-based non-traditional programs. In the initial stages of the course, non-traditional students may be reacting to the larger amount of printed materials and instructions in the correspondences units. These materials may tax their verbal abilities and self-management skills. Traditional students, on the other hand, are familiar with course management procedures and generally possess the requisite skills to handle the printed materials. Television may be an initial novelty for this group that wears off as the course proceeds over the year. The non-traditional students turn to television as a preferred mode for receiving instruction after mastering the format of the other materials. More research on this question is needed.

BOU Courses in the United States

Since the Open University has spent considerable effort developing their program, a number of American universities decided (in 1972-1973) to try the Open University materials in their own instructional programs. Considering our limited previous experience with the recording and use of "imported" courseware, the Carnegie Foundation asked the Educa-

tional Testing Service to conduct a study of the consequences of the transfer process on American faculty and students (Hartnett, et al., 1974). Four institutions were identified as having decided to offer OU courses: the California State University at San Diego, the University of Houston, the University of Maryland, and Rutgers University. Unfortunately for this survey (and the ETS Study) CSU at San Diego found it necessary to withdraw from the study in its early stages. The results of the study are summaryzed briefly below.

Evaluation of BOU Courses at American Universities

At all three institutions both the faculty and students were generally enthusiastic about the Open University courses. All of the institutions found it necessary to make slight modifications in the course materials to fit local conditions. For example, pacing of the lessons had to be slowed, content had to be adjusted slightly in the science courses to give adequate preparation to those students who desired to go on to more traditional higher education science courses, and considerable effort had to be expended to give adequate training to American tutors.

United States faculty members were particularly impressed with the structure and content of the Unit Booklets, the television films, self-assessment questions, tutor

graded exams, and the science laboratory home exam. They were less impressed with the computer graded exams and the audio programs. They generally agreed that the materials would be useful in the United States for adults with high school degrees.

One serious problem with this transfer process involved the television programs. Royalty and contractual agreements in Britain prevented their broadcast by American public and commercial stations, necessitating the production of 16mm film versions of the programs and their screening in study centers. This copying process was unsatisfactory and resulted in particularly poor sound reproduction. Although the faculty members thought that the difficulty did not make learning impossible, they expressed the opinion that public broadcast of these materials would have resulted in a better course of study and more convenience for the students.

Implications for Sharing of Courseware

The fact that the three universities surveyed by Educational Testing Service reacted favorably to the Open University courseware does not necessarily imply that American universities or non-traditional postsecondary education systems will immediately begin equally successful exchanges. We suspect that it may be easier to promote successful exchanges between politically and culturally compatible

countries and between states and more difficult to affect such exchanges between competing institutions within a state. We are not suggesting that competitive bias is the only factor influencing such exchanges, only that it needs to be considered in future plans. A crucial factor in the successful Open University courseware transfer is the excellence of the Open University materials, probably a direct result of the talent, funding, adequate time, and government support accorded the project.

The State University of Nebraska and the University of Mid-America

Currently in the developmental stage, the State University of Nebraska (SUN) is our nation's newest and most thoroughly planned alternative postsecondary education institution. It is the prototype for an interlocking series of midwestern universities that will eventually form the University of Mid-America (UMA). Other participating institutions include Kansas State University, the University of Missouri, the University of Kansas and Iowa State University. We will first present a brief description of the SUN Project and then describe the open learning model of the University of Mid-America and its relationship to the SUN experiment.

The Beginnings and Objectives

As a result of a statewide postsecondary education needs assessment, the University of Nebraska determined in 1971 that at least 20,000 Nebraskans (2% of the population of the state) were interested in postsecondary education but were prevented from enrolling in traditional higher education institutions by work, finances, family obligations, and/or geographic isolation.

With a $25,000 planning grant from the United States Office of Education, university officials conducted an additional "marketing type" study about how people in the state would react to an open learning system offering both credit and non-credit courses. The results indicated that the market was large enough to warrant the establishment of the SUN Project. Additional funds were received from the National Institute of Education, the National Endowment for Humanities and the Edna McConnell Clark Foundation totaling $2 million for the organization of the SUN Project, the production of three initial courses, and the establishment of prototype regional learning centers.

Basically, SUN has been planned with an attempt to learn from the past mistakes of previous alternatives to postsecondary education systems. The full range of available strategies from the relatively new instructional technology field are being employed, including differentiated

staff, and a commitment to the thorough evaluation of the staff, organization, instructional development and delivery processes.

An attempt is being made to cut elaborate and confusing enrollment and administrative procedures for the SUN students. They will be allowed to proceed through course materials at their own pace and choose among a variety of delivery mechanisms including broadcast television (in cooperation with the Nebraska Instructional Television Network), workbooks, textbooks, audiotapes, long-playing records, video cassettes, tutors and local newspapers.

SUN hopes to act as both a conduit for formal education and a vehicle for non-formal study. Students will be able to enroll in courses for formal credit that will be transferable to established colleges and universities. They may also enroll in a "not-for-credit" category that will be less expensive.

Eventually SUN planners hope to have a catalogue of 55 courses ranging from formal offerings with wide appeal (accounting and family finances) to non-traditional arts and crafts selections. Currently three courses are being developed and tested: Accounting I, Introductory Psychology, and a History of the Great Plains. Two of these courses (Accounting and Psychology) are being offered for the first time as this report is being written.

Since the SUN Project is the prototype project underlying the eventual organization of the University of Mid-America we turn now to a description of the preliminary model for the UMA system.

The Open Learning Model

As a result of a survey of existing open university systems, a model for the University of Mid-America was developed. According to the model UMA will have the following characteristics:

1) A policy of unrestricted admissions;

2) A target audience of those who desire further education but cannot or are reluctant to participate in campus-based programs;

3) A commitment to the planning of learning opportunities based on learner needs and objectives;

4) A recognition of variation in individual abilities and preferences and a willingness to "meet the learner where he or she is educationally able;

5) A policy of counseling students to assist them in using UMA resources to best advantage;

6) The provision of learning opportunities which enable the student to learn at times and places which minimize interference with jobs, families, and other obligations;

7) A reduction of constraints on the accessibility of instruction through the utilization of a variety of educational media and materials enabling students to learn in ways most comfortable to them;

8) A philosophy of allowing students flexibility in constructing their learning sequences so that UMA "courses" do not have single entry or exit points, nor single evaluation requirements for all students;

9) A curriculum offering problem and topic-oriented interdisciplinary instruction as well as traditional discipline-oriented instruction;

10) A commitment to utilizing existing local and regional resources for the design and delivery of instruction (including existing institutions) so that instruction is brought to the student in his or her own environment;

11) An emphasis on learning and on student satisfaction rather than on the compliance with arbitrary standards of temporal and curricular requirements;

12) A level of academic quality in courses bearing college credit which is compatible with traditional universities so that work accomplished through UMA will be fully accepted by other institutions;

13) An openness to self-examination (internal and external research and evaluation) and a commitment to the evaluation of system effectiveness in meeting both institutional and student objectives;

14) A commitment to the evaluation of student achievement and to the refinement of programs based upon the results of evaluations;

As with most goals, the ultimate test is in the eventual learning and satisfaction of the students who are served by open learning systems.

Program Management

Since very little data are available due to the preliminary nature of the SUN Project we will instead turn to a description of the current plans for program management and, in the next section, evaluation. During the next two years, the University of Mid-America hopes to undertake a number of investigations in the areas of the delivery of educational opportunities, curriculum planning, course development, and consortium planning and development.

The Delivery of Instruction

An effort is currently under way to examine the effectiveness of management procedures in the SUN Project. Data are being collected which will stimulate ongoing refinement of operations procedures and which should eventually be instrumental in formulating generalizations useful for the design of open-learning delivery systems in other states.

The effectiveness of the UMA learning centers will be evaluated for the next 18 months. Data will be collected on the role of the learning center coordinator and the support staff; the relationship between learning centers and other institutions of higher education; connections between course/faculty and learning centers; the physical design of the centers; and the role of educational information gathering and dissemination throughout the network of learning centers. Based on preliminary data, the University of Mid-America staff will refine the conception of the learning center and begin development of guidelines for the operation of all the centers. It is expected that data about learning center operation and effectiveness will be available for use in other state delivery systems by June 1976.

About the same time a detailed plan will have been formulated for developing and training open learning faculty and learning center staff. This plan will address such subjects as: desired background; personality characteristics

required; information and skills that must be acquired; and ways to achieve these goals through training and selection. Guidelines for developing training programs for learning center staff are also expected to grow out of this work.

The question of the antecedents of student attrition will be studied in depth, and tentative recommendations about the reasons for completion or non-completion of open learning courses will be developed. It is expected that these will result in adjustments to admissions policy, delivery system operation and/or course design. The University of Mid-America staff intends to conduct this type of study as an ongoing procedure. They plan to use the information generated to continuously adjust the open learning system so that it will be responsive to individual and societal changes related to student attrition.

Two primary projects for this initial period will be the determination of the type of students that the University of Mid-America <u>might</u> serve (and to collect information about who actually is served) and the development of a specific and comprehensive plan for the delivery of open learning educational services to the UMA participants. Information about who is and who might be served will lead, it is anticipated, to a body of data enabling learning centers to provide more adequate counsel to student clientele. A comprehensive plan should yield specific inventories of available resources, and establish tested delivery procedures

(perhaps the most difficult and important aspect) that will include commitments from appropriate agencies, institutions and/or individuals (e.g., educational television stations, newspapers, local education agencies) to perform services relevant to the delivery system.

Curriculum Planning

Although a number of alternative postsecondary education institutions have had considerable experience with curriculum planning, only some of the knowledge gained from experience can be shared among institutions. Practices that have been successful in some settings must be evaluated to determine their appropriateness for other settings. The University of Mid-America is in the uncomfortable position of having to develop both specific course offerings and, at the same time, procedures for curriculum development. They must determine the course content and developmental procedures which will work most effectively for the particular organizations and students in the UMA Project. The curricular philosophy that is being developed has at least two separate (but related) parts:

1) An attempt will be made to specify criteria for the production and/or acquisition of courses. An attempt also will be made to provide operational definitions (relevant in the UMA setting) of such

terms as "orientation to the learner," "individualized instruction," "modularization," "interdisciplinary," "problem centered," and "academic quality." Additionally, the developers intend to detail both the cognitive and non-cognitive goals for the University of Mid-America.

2) Curriculum planners also will develop guidelines concerning how courses relate to one another and how they might be clustered in meaningful sequences (e.g., various degree programs). Decisions will be made as to whether the University of Mid-America should have one curriculum or many curricula (or degrees); and decisions will be made concerning the kinds of personal and social change to be sought as a result of the open learning experience.

Guidelines derived from the data collected during the presentation of the first few courses will be used in UMA planning as well as in future course development efforts to ensure that what is known about how adults learn will be considered in all future decisions. These adult learning guidelines will be published by UMA and will be available to all other states.

Course Development

In addition to two courses which have already been developed (and are now being offered), one course is currently in production, and nine more courses will be produced and/or acquired. Considerable attention will be given to the process of instructional design and the refinement procedures for courses that are acquired. Each of these courses will be available for lease in other open learning systems. It is hoped that improved design techniques for modularizing courses to increase their flexibility will be developed, tested, and used. The detailed procedures for the entire process of adapting existing courseware will be available for use in the University of Mid-America and as models for other open learning systems. Parenthetically, one of the current course offerings (Introductory Psychology) has been acquired by the SUN Project from CRM Inc. (a for-profit corporation). The same course is currently being offered in California by the CSUC Consortium for ITV. The University of Mid-America has spent a considerable amount of time studying ways to adapt the course to meet local needs at the SUN Project.

Another aspect of course development is the acquisition of data which will make it possible to demonstrate course effectiveness to students, other University of Mid-America clients such as taxpayers, other institutions of higher and

secondary education, UMA Board members, and sponsors. It is expected that this data will be useful in curriculum planning, course development (including courseware design, production and refinement) and learning center administration (including advising, counseling and tutoring).

The most interesting projects underway in the course development area will involve the development of guidelines for media selection and UMA course selection. An important assumption that the UMA professional staff have made is that the only significant criteria for the selection of media to deliver instruction are affective measures (e.g., student liking, satisfaction, or preference for particular media) and geographical considerations which produce physical constraints on the types of delivery systems that can be used efficiently. The UMA staff has placed considerable emphasis on building upon the experience of previous media-based systems such as Children's Television Workshop and the British Open University. Rather than duplicate studies undertaken by those institutions they intend to extend the research on factors which affect the selection of media for course delivery.

UMA also will have developed a set of principles and procedures for course revisions and suitable time lines for the revision process. The principles and procedures will deal with effects which the revision of one course has on other related courses. Most importantly, there will be an

operational model which allows the results of student surveys, consultant's opinions, and the judgments of the UMA staff to be channeled back into the course development process.

Consortium Planning and Development

The UMA will eventually encompass a great number of participating midwestern higher educational institutions, and many decisions remain to be made about agreements among those institutions. During the next two years, UMA will attempt to determine:

1) Whether credit and/or degrees will be offered by UMA or individual institutions.

2) Whether the consortium will be expanded and if so, how that expansion will take place.

3) What type of social change will be brought about by the operation of the University of Mid-America. Procedures will be developed to collect data that will monitor social change and subsequently influence the allocation of resources in the consortium.

4) What administrative procedures will stimulate effective (a) ongoing project evaluation, (b) determination of the factors leading to economic

self-sufficiency, (c) the establishment of procedures to ensure organizational capacity to use the kinds of evaluative and experimental data generated, (d) comparisons of course costs and effectivenesses, (e) opportunities for professional staff development, and (f) training of leaders in management for the UMA operation.

In each of these areas of consortium planning and development, position papers and guidelines will be made available to other states considering similar plans.

The Evaluation Plan

The most distinctive feature of the SUN Prototype Project of the UMA consortium is their comprehensive evaluation plan. The special Office of Research and Evaluation has been organized, and the individual directing that office has been appointed as a Vice President of the State University of Nebraska.

Essentially, two types of evaluation activities are either planned or under way. The first type might be characterized as formative evaluation -- procedures aimed at gathering data useful to designers, producers, and delivery system personnel as courses are being developed and delivered with the intent of improving that development during the formative stages. The second type of evaluation is

summative -- directed toward obtaining data useful in understanding the outcomes of the SUN Project.

An example might clarify the distinction between formative and summative evaluation. If Course X is being developed by the UMA, formative evaluation data might be obtained through testing a draft version of the study guide being created for the course. Data from the test might be given to the developers who would use it to revise the study guide or revise the course content. Summative evaluation would occur after the administration of the course. Information might be gathered on student achievement, attitudes towards the course, and ease of administering the course. This data could be used to indicate some of the consequences of presenting the entire course. The distinction between the two approaches blurs when the summative data is used formatively to influence the development of subsequent courses.

Formative evaluation. Formative evaluation at the UMA/SUN Project consists of a variety of activities aimed at gathering and reporting information during the development of courses and during the establishment of delivery systems. There are four types of formative work underway:

1) Developing achievement measures;
2) Prototype testing;
3) Field testing; and
4) Delivery system evaluation.

Developing achievement measures. After experimenting with a variety of achievement measures during 1974, the SUN Research and Evaluation staff has found that the most effective and efficient means of creating achievement measures is to initially engage content specialists in writing "first draft" exam items. The items are reviewed and revised by a measurement specialist. Then they are grouped into examinations which are carefully reviewed by a resident content specialist. The exams are given to a sample of the students who will be taking the course and further revised as needed.

In another area, considerable attention has been given to the analysis of tests designed to serve as informal self-examinations and as a means of lowering student anxiety.

Prototype testing. In August of 1974, a group of students thought generally representative of those who would enroll in one of the initial courses (Accounting I) were asked to "take" accounting while the course was being developed. This micro evaluation technique involved asking the students to read the text, study guide, and newspaper components, and to listen to the audiotapes and view the televised lesson much as actual enrolled students would. The experimental student group was then asked to complete a variety of written evaluation questionnaires about each component of the course and the students were engaged in detailed oral "debriefings" with an evaluation specialist.

In addition, these individuals took achievement tests (including a pretest to determine the knowledge that they brought to the accounting course).

This prototype testing technique did reveal interesting and useful information for the SUN developers. For example, it was found that the course was well received overall. It was determined that several particular parts of the televised component were either unacceptable or missing. The procedure also revealed some inadequacies on achievement tests which were subsequently revised. Mainly, this technique indicated how students felt about the course and what they would like to see done to improve it in general.

A number of difficulties with the prototype procedure were obvious. The most serious difficulty involved timing. Because of the severity of time constraints usually involved in development projects, it has been very difficult for the SUN developers to test the materials and get the appropriate data back to the staff in time to significantly influence program development. Another difficulty, although less serious, concerns the selection and recruitment of participants for prototype testing. It is difficult to determine what kinds of students should be sought and from where. During the initial design stages of alternatives to post-secondary education systems, predictions must be made about typical learners (for testing procedures) before instructional designers actually know what kinds of people will

choose to take the courses they are offering. In addition, the time commitment for individuals in the prototype test groups (approximately 16 weeks) is considerable and many people are reluctant to participate. SUN staff members generally feel that it is imperative that:

1) To the extent that overall course development time permits, materials should be tested with representative learners. However, not all learners need work with all materials, nor must all materials be tested in their entirety. The evaluation techniques developed thus far appear to be useful in developing courseware.

2) Learning centers may be useful sites for prototype testing. Learning center staff members may wish to direct prototype testing.

3) In some instances, it is appropriate to utilize a review panel of adult educators, media specialists, learning specialists and students to examine plans for materials, as well as the materials themselves as they are developed.

Field testing. Field testing in the University of Mid-America occurs during the first two official offerings of a particular course, after which revisions in the course will

be made according to data collected during the field testing. At the SUN Project field testing activities include:

1) Obtaining extensive information about each learner through the Learner Characteristics Questionnaire;

2) Obtaining learner evaluations of each unit of the course by using a "tell us what you think" evaluation sheet;

3) Preparing and administering an end of the course evaluation form to learners as they complete the course and;

4) Analyzing achievement test data and surveying by telephone all enrolled learners at various times during the course.

All of these data, together with more formal observations obtained from Learning Center staff and course professors, are combined to yield an overall picture of the course. From these data come suggestions as to particular problems that might be examined in more depth during the second offering of the course.

One crucial finding in the SUN experience has been the importance of involving the course development team in all aspects of decisions about field testing. If the data collected are not addressing the questions held by those team

members designing the instruction, then the data will not be used in the subsequent redesign of the materials.

Delivery system evaluation. Four learning centers have been set up in various locations in the state of Nebraska. Evaluation of the effectiveness of these centers consists mostly of identifying, from the point of view of learning center coordinators and assistants, areas in which the centers are successful, and in identifying their needs for resources, and staff development. It is our impression, as outside viewers of the SUN prototype, that much less attention has been paid to the evaluation of learning center activity. However, it should be noted that the primary direction of SUN staff energies have, by necessity to date, been invested in course development and evaluation. It is expected that during the next year of the SUN Project more effort will be focused on working with state delivery coordinators in each of the UMA states to develop and subsequently implement evaluation programs for each state delivery system.

Summative evaluation. This evaluation technique, much more familiar to managers of traditional higher education systems, has not received as careful attention as the formative plan detailed above. The reason for this involves the necessity to direct energies to the initial developmental stages of a program. However, when summative evaluation is

used without the advantage of prior formative data, designers of alternative postsecondary education programs are faced with the necessity of wasting as much as one or two years after a program has been implemented to find out whether it worked or not. Initial investments are lost if parts of programs are not successful because formative evaluation plans are not used.

Rather than characterize the entire summative evaluation plan for the SUN prototype, we have summarized some of the generic questions that the UMA staff will ask about the consequences of the complete courses over a five-year period. There are essentially 12 types of questions that will be asked:

1) Need (Justification): Did the project fulfill a defensible need? Want?

2) Market (Dissemination): Is the project capable of reaching adequate numbers of appropriate clientele?

3) Performance (True Field Trials): How well do the materials perform under a field test situation?

4) Performance (True Customer): How well do the materials perform after they are established in everyday use?

5) Performance (Crucial Comparison): How does the project compare to others where such a comparison is appropriate?

6) Performance (Long-Term): Does a follow-up study produce any new data?

7) Performance (Side Effects): Can a systematic independent evaluation determine any side effects of project activities?

8) Performance (Process): How does the process of material development, dissemination, and utilization function?

9) Performance (Causation): Can any particular outcomes be specifically attributed to the project's existence?

10) Social Significance: To what extent can it be shown that the provision of an open learning adult education system is a benefit to the society?

11) Cost Effectiveness: To what extent is the project cost effective or under what conditions could it become cost effective?

12) Extended Support: To what extent will the project continue to revise its services and extend its benefits to new audiences?

It should be emphasized that these 12 questions describe an ideal range of evaluation concerns. SUN evaluators have stated that they wish to alter these questions in response to other concerns as they develop over the next few years.

Cost Effectiveness Considerations of the UMA/SUN Project

The largest single problem encountered by the UMA/SUN Project is the widespread concern by the staff and funding agencies with the cost effectiveness ratio of this new endeavor. In a time of generally declining enrollments, increasing costs, and a general lack of growth in higher education, we could expect that any program which emerges as a new effort in postsecondary education will undergo particularly close scrutiny from a wide range of publics including (but not limited to) taxpayers, federal agencies, foundations, higher education institutions in the UMA region, and SUN staff. There is some feeling in the higher education community that, given the general lack of growth within higher education institutions, this expensive alternative for postsecondary education may be unwarranted at this time. Other observers of the SUN Project comment that it is too early to make a judgment about its eventual impact on higher education in general, and that the actual benefits to be realized from the many new techniques being developed by UMA

experiments will not be immediately apparent. We feel that a brief description of some of the factors that enter into these two generalizations would be useful.

Those who believe that SUN may be too expensive point to the fact that about $2 million have been expended to date on the SUN Project, yet only two courses are being offered. One of those courses, Introductory Psychology, was purchased and modified rather than entirely designed by SUN staff. A third course is under production and will not be released until sometime later this year. Even under the best of circumstances, assuming the delivery of three courses for $2 million, each of those courses will cost UMA approximately $666,000 to deliver. To some critics that seems to be an excessive cost.

We find ourselves most in sympathy with those observers of the SUN Project who suggest that it is simply too early to make such a judgment. A number of factors influence the cost-benefit ratio. First, it appears that there needs to be a large investment at the initial stages of course development and that (as in the experience of the Chicago TV College to be discussed later) costs must be distributed over repeated replays of the course. Second, the commitment to an instructional technology approach to course development requires initially high investments in the formative development of course models. Third, much of the initial evaluation in a course deals with the cost-benefit tradeoffs in various

types of course formatting. For example, SUN is investigating relative benefits involved in high vs. low cost television and purchasing existing courseware vs. designing new courseware. These experiments are expensive but once useful data are retrieved future decisions can be based on previous experiments thereby reducing costs. Fourth, there tend to be conflicting requirements imposed upon SUN by those who are financing the project. Each funding agency has its own specific set of evaluation and reporting requirements. This has caused some duplication in the expenditures of staff time and associated costs.

It's our general feeling that the SUN prototype should continue to be supported as long as UMA retains its overwhelming commitment to internal and external evaluation of cost-effectiveness. In this way, the results of the SUN research and evaluation of this type of postsecondary education alternative will be available to other states, and the cost of creating similar projects will be inevitably decreased.

The Free University of Iran

Currently in its formative stages, the Free University of Iran is loosely modeled after the British Open University. It has been mandated by the Iranian government and Ministry of Education to compare, assess, and deliver postsecondary higher education courses in three areas:

1) Paramedical instruction;

2) Teacher preparation; and

3) General education.

The planned program has a number of exciting features:

1) Courses will be prepared by an instructional development team.

2) The Free University is committed to evaluation of courses before they are offered.

3) Conditions in rural areas require the use of a great variety of delivery systems.

The Instructional Development Team

The Free University is committed to Instructional Technology in its fullest sense. For the Free University, a systems approach has led to the establishment of course development teams consisting of a content specialist, an instructional technologist, media producers, and delivery specialists.

The Content Specialist is often a faculty member from the University of Tehran who has the required expertise in the subject area of the course. The University staff has also attempted to choose content specialists who are familiar with the Free University's expected clients. These

professors are released from regular teaching duties for one full year and part of another so that they can devote full attention to every phase of the development process.

Instructional Technologists

We believe that this profession is the most innovative element of the Free University's program. Essentially the instructional technologist's role is to mediate between the content specialist, media producers, and those with the responsibility to deliver instruction by:

1) Interpreting course content requirements into measurable goals;

2) Setting up evaluation designs (particularly in the formative stages of course design);

3) Selecting the appropriate media for formatting instruction;

4) Working with the media staff to produce the content specialist materials in the desired format;

5) Involving delivery (dissemination) specialists in course production decisions;

6) Interpreting formative evaluation data in ways that are meaningful and useful to the media

producers and content specialists so that course segments may be revised according to evaluation data.

Very few of these specialists are currently available in Iran, but the Free University has started a crash program to train them in this country, in England, and in Iran.

Media Producers

A great range of talents is required of these professionals since local delivery possibilities vary greatly throughout the nation. In the larger cities, television will be a primary device coupled with Free University learning centers. Centers will contain libraries of resource materials (books, course outlines, films, charts, slide-tapes, television sets, audiotapes, and laboratory equipment, etc.). Media specialists are currently requiring a certain amount of "dedicated" production equipment but they will also share the television and film studios being used by the National Iranian Radio and Television Organization.

Delivery Specialists

Iran is a nation currently undergoing a period of extremely rapid growth and development. Consequently, social and technological conditions for delivering Free University

courses differ greatly from one geographical region to another. It is the delivery specialist's job to:

1) Assess the unique characteristics of each delivery area and advise the course development team of local conditions that may influence course format, assessment, and of course, delivery;

2) Develop plans for the efficient delivery of course related materials and services;

3) Provide services for local tutors; and

4) Act as a liaison with local education agencies and national broadcasting facilities.

The Free University is making extensive use of evaluation techniques to ensure that courses "work" before they are delivered. Basically, preliminary versions of course modules are given to a sample of students chosen randomly because they are representative of the population that will eventually receive the course. Extensive interviews are conducted to determine how each part of the course is received and to determine if students are having a special problem that the course development teams did not anticipate. Another feature of the formative evaluation process being employed by the University Instructional Technologists is the administration of special proficiency tests. Since

the background and experience of the students varies geographically and ethnically, and tends to be different from the norms for the typical Iranian higher education student, it is necessary to assess those differences that require remedial instruction before a student can begin professional, paraprofessional or general training.

The Chicago TV College*

The Chicago TV College is the oldest media-based, degree granting postsecondary education institution in the country. Its stated purpose is to bring higher education to those residents of the Chicago metropolitan area who cannot attend traditional institutions.

The Chicago program is an extension of the state and locally supported community college of Chicago. It does not have a campus, and until this year studio space was rented from station WTTW, a public television station. TV College now has access to a television studio on a campus of the City College, but broadcast time is still rented from a public broadcast station. The instructional programs can

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*Much of the information for the first part of this section was borrowed from a very perceptive case study by Dr. Donald Ely that will appear in his forthcoming book Technologically Speaking . . . A Guide to Instruction for Off-Campus Learning. Errors in interpretation should not be attributed to Professor Ely (who generously shared his research) or the Chicago TV College staff.

be viewed on home television sets. In-class viewing takes place in the existing classrooms of the City College campuses.

Approximately 215,000 credit hours have been completed by over 150,000 Chicago area residents (70,000 were "credit" students and 80,000 were "not-for-credit"). Throughout the history of the college nearly 75% of the students have been women. The only major change in the student body has been a gradual drop in the average age (from 33 in the 1950's to the present 29). Besides women, the only other disproportionately represented college participants are the prisoners in the Illinois penal institutions and residents of Veteran's Hospitals.

Although over the years only 400 students have received Associates in Arts (AA) degrees entirely by television, 75% of those degree holders are prisoners and veterans. Both correction officials and Veteran's Hospital administrators have given strong support to the program. They generally feel it has made an important contribution to their rehabilitation programs. TV College officials feel that the program is "a conduit" that captures the interest of those people not attending institutions of higher education and channels them into conventional colleges and universities.

About 2,300 students are enrolled currently at the community colleges in the TV College courses. The TV College classifies students in four categories:

1) Home viewers: those who have no contact with the community college activities (70%-80% of the student body);

2) TV concurrents: those also enrolled in traditional higher education institutions (20%-25%);

3) TV in-class viewers: those students who take TV College courses through community colleges and watch course programs in classrooms with other students; and

4) "Not-for-credit" viewers: who pay $1 and receive study guides, and are encouraged to follow the course without taking exams.

Special students who take advantage of the program are gifted high school students, military personnel overseas (about 9,000 enrolled per year) and, according to college surveys, about 250,000 "casual" viewers in the Chicago television coverage area.

Recruiting Students

Even with about 3,000,000 potential students in a 75-mile radius, recruitment is a problem that the college has had to face every year. The procedure which seems to work best is a brochure that is mailed to 45,000 students and

10,000 government agencies (schools, public libraries, etc.). Enrollment takes place by mail and on all community college campuses.

Four television college centers are located in various areas to provide resources, information about the college, and a place for examination and tutoring. Confined students are given assistance and exams by social workers, hospital staff, correctional workers, ministers, etc.

The Television Broadcasts

Generally each course consists of 30 televised programs or modules, each running 30 to 45 minutes. Two modules per week are broadcast during the 15-week semester. For 16 years the programs were aired twice a day -- in the afternoon to reach at people at home during the day and in the evening after dinner to reach working people. Evening enrollments accounted for two-thirds of the student body. In 1973, however, a problem with one of the public television stations led to the discontinuation of the evening broadcast. This has caused serious enrollment declines for the college. Many of the evening students have been forced to suspend their studies even though the college has begun to broadcast an entire week's programs on weekends. As a consequence of this misfortune only four credit courses are currently offered per semester.

The Curriculum

Four types of courses have usually been offered:

1) Traditional sequences necessary for Associate of Arts degrees (Science, Humanities, and Social Sciences);

2) Vocational courses (Secretarial, Business Law, etc.);

3) Electives (Literature, Fine Arts, Philosophy, etc.); and

4) Teacher preparation and renewal classes (nearly 50% of the enrolled students indicate a desire to teach but with the drop in teaching positions, these courses have been de-emphasized).

This academic degree-oriented curriculum is in a stage of transition. Previous state legislation required a more traditionally-oriented mix of courses and now new legislation will allow a greater percentage of vocationally focused offerings. This change has been enthusiastically received by the TV College staff who have long wished to serve students not necessarily involved in traditional academic course sequences.

Aspects of Television Instruction That Make a Difference

The TV College staff has found that television offerings must be supplemented with traditional instruction. They have found, for example, that when study guides are placed in a programmed learning format, student attrition rates drop, the number of students completing courses increases (currently the completion rate is 70%-80%). They have also found that personal contact between students and teachers (or tutors) is essential. All TV College teachers schedule face-to-face conferences with students periodically. For a few courses these encounters are mandatory (e.g., foreign languages) but for most they are optional. All teachers schedule from two to three hours per week of telephone conference time. Students requiring help may call for discussion during the specified hours.

In addition, college staff have found it useful to provide alternative ways to deliver instruction. For several years audiotapes and video casette recordings of the broadcast courses have been placed in the downtown public library, and recently in other public libraries in Chicago through a project entitled Study Unlimited. Each of five current participating public libraries assigns specially trained librarians "Learner Advisors," to register, acquaint students with course materials and administer exams. Advisors keep track of individual students and phone them if it appears that

they are avoiding coursework to ask if they are having special problems or need assistance. These advisors serve more of an administrative and personal support function than the typical academic tutorial function. Administrators are watching the results of this experience carefully but early impressions are favorable. An added advantage of the TV College public library cooperation is the opportunity for student control over the pacing of courses. Television broadcast schedules are necessarily rigid. The Study Unlimited program enrolled 200 students during its first semester and continues to grow. It is also interesting that the average age of the students is 29, nearly 10 years younger than the current average broadcast television student.

Perhaps the most unexpected and interesting finding by the Chicago TV College has been that in order to maintain enrollments from year to year, the College has had to offer a variety of courses and to avoid repeating courses each semester. The faculty has concluded that regardless of the size of the population that needs to be served, courses should only be repeated at one-and-a-half to two-year intervals. Presumably, repeated courses are received with all the enthusiasm normally reserved for television summer reruns. During the interval between the use and reuse of a course a large group of potential students enter the TV College audience.

This finding is crucial for those assessing the cost-benefit aspects of television-based postsecondary education. It has been assumed that one of the financial advantages of the television delivery system is program "repeatability" -- i.e., distributing an initially large production cost for television programs over repeated presentations.

One inference which can be drawn from the Chicago experience is that educational planners should not expect to use the same course materials repeatedly in a broadcast-type delivery system without concern for the probability of decreased enrollments and therefore decreased tuition revenues with overly frequent use of video materials.

Evaluation of Instruction and Learning

One of the unique features of the TV College is its long-standing commitment to the evaluation of most facets of the instructional program. A number of findings in this assessment have held up over time and are directly relevant to the design of media-based, non-traditional programs.

Student learning. When student achievement is compared among the older but conventionally instructed evening community college students, in-class television students and at-home television students, the at-home students have consistently outperformed all other groups. The next highest

achievers are the in-class students followed by the evening and daytime conventionally taught group.

There are at least two explanations for this difference: (1) student motivation, and (2) the instructional design process. Student motivation and maturity tends to be greatest in the at-home group, and this fact appears to account for a significant proportion of the differences among the groups. Since World War II educators have recognized the important contributions made to postsecondary education programs by older and more mature veterans who entered college in the 1940s. This "maturity" effect seems to be a consistent factor in student learning over time in the Chicago TV College.

Another explanation for high at-home student achievement is the amount of time and resources allocated to the instructional design process for the TV College curriculum. Professors are given an entire summer to plan a single course and one complete semester to produce the television series with the assistance of a television director, graphic artists, and television studio crew. The printed study guide and self-assessment exams (not normally associated with conventional higher education classes) may also contribute to this advantage.

In summary, we suspect that the large difference in achievement between all the conventionally taught students and the at-home television students is due to motivation and

maturity; the differences due to instructional design procedures may be found in the disparity of learning scores between the television in-class students and the equally mature and motivated community college evening students.

Aspects of television production formats that contribute to learning and student satisfaction. During the past two years, the TV College has been attempting to find those types of television production styles that lead to the greatest amount of student learning. This is possibly the question most frequently asked of television-based postsecondary education programs. Previous research on the question has favored linear sequenced (those that carefully move from one explicit instructional point to another) and expensively produced programs. College officials worry, however, that those programs are boring and do not hold student's attention.

Most college television programs are inexpensive productions (only one-third of the college budget goes to actual production and broadcast) that might be classified as of "the talking head" variety. Instructors have carefully prepared lectures but generally there is a lack of visualization of concepts. Available funds do not permit extensive use of the graphics, motion film inserts, elaborate sets and location shooting, normally associated with commercial television programs. Since program goals focus on cognitive (academically-oriented) learning most of the College

evaluations have shown that the spartan production format works to achieve cognitive goals but the students do not like or prefer it.

An experiment. Last year the College acquired an expensively produced program offered by Miami-Dade Junior College entitled "The Individual in An Urban Environment." Programs used dramatization, professional actors, narrators, location filming, archival photojournalistic techniques; and followed student study guide textbook descriptions to make them compatible with exams. The program costs about $1,000 per minute.

The TV College staff compared the learning and appreciation of the Miami-Dade Program with a locally produced program on interaction between landscapes and plants with human beings in an urban environment. This program cost about $100 per minute.

Through interviews and tests the researchers attempted to discover which program would result in the greatest learning and satisfaction. The results were that students learned more from the program they liked less -- the local inexpensive product, and conversely, learned less from the program they liked more, the expensive imported program.

Rather than interpret these results as indicating the need for only inexpensively produced broadcasts the staff has focused attention on the importance of increasing student

satisfaction with moderate production investments. Will the "spartan" offerings continue to hold the interest of even the most motivated students? Are the more traditional measures of cognitive abilities accurately tapping the concepts that are acquired from embellished television programs? How important is it to engage the interest of these students with desirable presentations before they can be taught formal concepts?

Chicago TV College asks their students similar questions and 75% gave a version of the following answer:

> Give us a bit of both. Alternate the two types of presentation formats, either within a single program, or between programs in the series.

We suspect this is a useful technique, especially for the non-traditional postsecondary education programs that seek to attract students who are not necessarily motivated to do complete conventional degree programs. The approach might reduce high attrition rates and attract a greater number and variety of persons to postsecondary education.

Teacher Selection

During the College's formative years the Ford Foundation asked that nationally recognized scholars be imported to produce a course series. Generally, this approach did not work. Local instructors had greater familiarity with the

styles, interests, and the academic needs of the local students. Since many of the courses also required interdisciplinary teamwork, local instructors worked better in team arrangements.

The higher education tradition of individual faculty control over specific courses has also mitigated against the use of "outside teachers" and against the renting or exchange of series in many media-based programs. Seldom discussed, this narrow professionalism is a factor that must be considered by designers of non-traditional systems. We strongly feel that a new breed of postsecondary education teachers are needed. This professional would specialize in assessing local needs and conditions. They would work with instructional design teams to produce, evaluate and revise courses in their disciplinary area(s). Compensation for work could be by short-term contractual arrangements and/or royalty agreements.

Administration and Facilities

As with a majority of California's televised postsecondary education offerings, the Chicago program is an extension of the state-supported community college of Chicago. It does not have a campus and it leases facilities from a public television station for television production and broadcast. One crucial factor in its success is the fact

that the television college dean reports to, and has had the support of, the community college Vice Chancellor for Academic Instruction.

Costs

Although another report in this series is covering the economics of non-traditional postsecondary education, a note on the costs associated with the Chicago program is necessary. Administrators estimate that the average total costs of a 30-program series (of 45-minute programs) is $70,000. By spreading costs over three replays of a course in six years (the average television course's "life expectancy") and by enrolling from 275-300 students each time the course is offered, the average cost per credit hour enrollment is calculated by the Chicago TV College at $45. By comparison, the Chicago Community College cost per credit hour is estimated currently at $50.

We do not suggest that televised postsecondary education offerings are necessarily less expensive than conventional offerings. Regional costs and conditions vary greatly. It is important to realize however, that the casual viewer of these programs is receiving their benefit without becoming a part of the cost estimate.

Disadvantages and Advantages

High costs have been the major problem of broadcast television delivery systems when used to instruct students enrolled in accredited educational programs. As in the Chicago TV College case, even though programs were produced to be reusable, they could only be aired once every year or once every two years, and between 275 and 300 students had to be enrolled per course in order to keep the cost per student in the same range as the cost per student of conventionally taught classes.

In order for programming to appeal to such large numbers of students the content must be less specialized than the content of most upper level undergraduate courses. For this reason most broadcast television-based accrediting programs offer an associate degree directed towards students interested in instructional content usually associated with the first two years of typical undergraduate instruction.

Chicago TV College demonstrates one of the key advantages of media-based extended postsecondary education systems. In the case of Chicago, it is the ability of the TV College to reach two groups of the metropolitan population who would not otherwise be reached by educational institutions -- prisoners, and patients in Veterans' hospitals. If these two groups were the sole recipients of the instructional broadcasts less expensive delivery systems would have

probably been used. Both these subgroups are confined to known locations so cable television, microwave, ITFS, or video cassettes could have delivered programs directly to prisons and hospitals. While it is the need to reach prisoners and veterans that makes extension education, in part, desirable, it is the additional service to a mobile and extensive urban population that makes broadcast television an appropriate delivery system in Chicago's case.

IV. THE INSTRUCTIONAL TECHNOLOGY APPROACH TO POSTSECONDARY ALTERNATIVES

An Overview

Historically, instructional technology and media have been thought of in terms of devices (such as radio and television) that were products of advances in communications engineering. Each new communications device has gradually been adapted to instructional use after being successfully developed and used (primarily) by entertainment-based industries.

At the turn of the century the major delivery systems for instruction involved the teacher, the textbook and the blackboard. From 1900 to the 1950s other devices were gradually introduced (e.g., photographs, motion pictures, and radio) and employed as instructional media. Traditional postsecondary educational institutions were basically conservative and resisted major changes in delivery mechanisms until television became a feasible delivery device.

Beginning in the late 1950s and early 1960s, aided by massive federal foundation grants and pressured by projections of rapidly increasing enrollments, many higher education institutions (particularly those east of the Mississippi) embraced television as a teaching device. In many institutions, as many as 30% of available undergraduate courses were offered via television sets placed in classrooms. Early

in that period, the Chicago TV College began offering an entire two years of undergraduate school via broadcast television. Facility planners urged colleges and universities to include television production and transmission facilities (cable and broadcast) in their physical plant expansion plans.

Because of the many intricate procedures necessary for implementing "educational" television very few institutions allowed themselves much time to ask "how should this new device be used?" or "what important postsecondary education problems does it solve?" or "what new problems does it present?" Television decisions were medium-centered, not educational-function centered. That is, the interest was focused on installing television and watching to see what it would do, rather than identifying an important higher education problem that required television (or some other medium) as a solution. Specific goals and objectives were ignored in the rush to bring media projects to an operational stage. This pattern extended to the development and educational utilization of other media devices such as programmed learning machines, rear screen projectors, self-contained motion picture projectors and screening devices, small instructional computers, video cassette machines, and programable audio-visual devices for slide tape presentations.

Educational researchers who attempted to clarify the problems and suggest solutions were initially afflicted by

media "tunnel vision." They tended to ask invalid questions which yielded confusing and contradictory results. The typical research question was "is television (or some other medium) more effective than classroom teachers in instruction?" About 30% of these studies produced results which favored television, 30% indicated teachers were more effective, and about 40% were inconclusive. The difficulty, of course, is that there is no useful generalization to be made from this research. These studies, by-and-large, were narrowly focused on the question of whether or not the medium alone (all other things being equal) would make a significant difference to learners. Conceptually it was as if holding a television set-like frame in front of a lecturer would change his effectiveness as a teacher.*

During the late 1960s it became obvious to a number of educational professionals that a much wider scope of concern was necessary in those professional areas described as audio-visual instruction, educational broadcasting, media studies, and educational communications. Educational sociologists were beginning to use the term "technology" in its broadest sense -- meaning the organization, procedures, setting, and group processes involved in designing and delivering instruction. From this conceptual base (and other social science theories) the area of Instructional Technology is being developed.

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*A review of media and technology research has been conducted by Salomon and Clark (1975).

A presidential commission on instructional technology defined the field by describing the "old" and the "new" approaches the following way:

> In its more familiar sense it means the media born of the communications revolution which can be used for instructional purposes alongside the teacher, textbook, and blackboard . . . (so called) . . . items of hardware and software.

The second and less familiar definition

> . . . goes beyond any particular medium or device. In this sense . . . technology is more than the sum of its parts. It is a systematic way of designing, carrying out and evaluating the total process of learning and teaching in terms of specific objectives, based on research in human learning and communications and applying a combination of human and non-human resources to bring about more effective instruction. (Commission on Instructional Technology, 1970)

In this view, any specific media becomes both a device for delivering instruction to students and a way to shape information to meet an instructional goal. The concern of instructional technology professionals however, is not limited to television, radio, films, and computers, but extends to the design and evaluation of instruction in any setting. The research in instructional technology also changed scope in the late 1960s. Comparative studies that had formerly sought the best media for instruction adopted more useful

sets of questions. As Cronbach (1966) put it, researchers need to ask:

> . . . that we search for limited generalizations of the following form:
>
> > with subject matter of this nature, inductive (or deductive) experience(s) of this type, in this amount, produces this pattern of (learning), in (students) at this level of development.
> > (Cronbach, 1966, p. 77)

It is this more expanded view of instructional media and technology that we wish to apply in this report. It is a particularly useful (and perhaps necessary) approach when describing and analyzing non-traditional postsecondary education programs, and a critical element that should be included in any postsecondary education model.

The instructional technological approach to education is based upon a belief that an ongoing cycle of (1) systematic and deliberate planning for and design of instructional systems; (2) evaluation of the effectiveness of the systems (in terms of desired educational outcomes per unit of expenditure); and (3) refinement of the systems in response to evaluation findings will result in an evolutionary process maximizing the utility of instructional systems over time while minimizing their cost.

Implicit in this approach are various requirements for the planners and managers of education. One requirement is

the development of specific objectives for instructional systems, the attainment of which can be measured. Another requirement is the analysis of alternative means of attaining objectives and a commitment to the selection of the best alternative given available information regarding relative costs and effectiveness. A third requirement is the ongoing gathering of information necessary for the evaluation of instructional systems once they have been implemented.

A useful scheme for the conceptualization of instructional systems (for the purposes of developing measurable objectives, comparing and analyzing alternative systems, and evaluating existing systems), emphasizes four major areas of concern: (1) the student; (2) instructional resources; (3) instructional development; and (4) the management of instruction. In this section of our report we will define these areas of concern in some detail.*

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*The authors wish to acknowledge their debt to a recent report titled "A Handbook of Standard Terminology and a Guide for Recording and Reporting Information About Instructional Technology" produced by the Association for Educational Communications and Technology under Contract OEC-0-73-7057 from the National Center for Educational Statistics, 1975. Most of the categories and suggestions in this section were taken from the Handbook.

Areas of Concern

The Student

The ultimate concern of all non-traditional postsecondary education programs is the student. The program exists to facilitate the student's learning, appreciation, and self-awareness. Instructional programs are developed, employed and managed to meet student and program objectives. Instructionally relevant information about the student (e.g., educational background, course content preferences, instructional media preferences, aptitudes, and so on) is required so that decisions about program goals and objectives, selection of media, and development of resources can be intelligently made.

At least six types of information are often relevant for non-traditional postsecondary education programs:

1) Personal identification: e.g., sex, language, ethnic characteristics, birth, age, etc.;

2) Physical, health, sensory and related conditions: e.g., vision, hearing, speech, handicaps, etc.;

3) Mental, psychological, and proficiency test results: e.g., a great range of possible predictors of performance from cognitive, affective, and motor skill tests;

4) Enrollment: e.g., entrance information such as the type of program entered, instructional grouping, full- or part-time status, day or evening status, etc.;

5) Performance: e.g., program of studies, evaluations, course information, co-curricular information, type of recognition for completing courses, etc.; and

6) Special assistance and tuition information: e.g., students with special eligibility for state, federal, or local financial assistance.

Instructional Resources

There are a great variety of resources that can be brought to bear to meet educational objectives. Educational technology deals primarily with six major categories of resources: instructional staff, subject matter, educational setting, instructional techniques, delivery devices, and materials.

1) Staff: Instructional technology typically deals with the actual content of staff assignments as opposed to job titles. In this category the concern is with the requisite instructional skills rather than the place where instruction is performed (classrooms or television studios).

2) Content: This area of concern deals primarily with the subject matter areas to be presented in the instructional programs. It is often interpreted according to traditional disciplinary categories (e.g., biology, English, mathematics) but should also include non-formal and interdisciplinary concepts that are dealt with in postsecondary education programs.

3) Settings: This is a crucial category for non-traditional postsecondary educational programs. In it the physical or geographical space where instruction is actually delivered and undertaken is specified (e.g., classroom learning resource centers, home).

4) Techniques: Included in this category are specialized procedures for formatting instruction. There is a great variety of possible techniques in postsecondary education. Most of them, however, are drawn from previous research on instruction or have been found to be valid in previous postsecondary education settings (e.g., peer tutoring, programmed instruction, pacing, self-evaluation, games and simulations, problem-solving devices, inserted questions).

5) Devices: This category is defined as equipment that is involved in either the production, reproduction, transmission or display of instruction. It is this area that has occupied most of the planning and thinking of those of audiovisual and broadcasting areas. The Association for Educational Communications and Technology's recent "Handbook of Standard Terminology and Guide for Reporting and Recording Information About Educational Technology" lists approximately 100 major categories for devices such as computer terminals, diazo copiers, television cameras, exposure meters, and micro-projectors. Within each of those 100 categories a great number of sub-devices are possible.

6) Materials: These are the supplies that service the devices mentioned in the previous category. The category includes such items as audiotape, videotape, and photographic film.

Instructional Development

Once the specific resources (materials, devices, techniques, settings) are identified, it is necessary to understand how to utilize the resources to obtain desired objectives. Galbraith, in his New Industrial State offers the

following view:

> Technology means the systematic application of scientific or other organized knowledge to practical tasks. The most important consequence . . . is enforcing the division and subdivision of any such task into its component parts. Thus, and only thus, can organized knowledge be brought to bear on performance.

With the design of postsecondary education institutions, this broad approach can be conceptualized in terms of five instructional development functions. These activities include: research and evaluation, design, production, logistics, and utilization. Each of these activities may be undertaken in planning the use of any instructional resources. Thus, one could begin with research and evaluation that is performed on materials, devices, techniques, and settings. It is also possible, of course, to design materials and devices. Although the resulting list of activities certainly reflects a wide area of concern, not all of these functions would be the direct responsibility of the instructional technologists. The production of settings, for example, would be the concern of architects and building contractors.

We turn now to the consideration of each one of the instructional development functions listed above:

1) Research and Evaluation: Essentially this function draws on scientific methodologies and techniques to generate and test knowledge, theory, and

research methodology related to instructional resources. The research function develops a body of knowledge which becomes a basis for planning and decision making. Evaluation activities also draw on research methodology to perform an assessment of instructional resources according to specific criteria. The ultimate concern of evaluation is the provision of reliable information for decision making in all areas of alternative post-secondary education systems. The evaluator might consider such questions as the suitability of the resource for a given audience of readers (design); the acceptability of the resource in meeting production standards (production); the suitability of the resource for retention in a collection (logistics); and the effectiveness of the resource in meeting specified objectives (utilization). It is the nature of the decision being made that determines the particular form the evaluation will take. Important factors include: requirements for data; the selection of criteria; the specific methodologies employed; and the way the data are formatted and presented to those making decisions.

2) Design: The purpose of the design function is the development of specifications for the production

of an instructional resource. These specifications are based on relevant research and data concerning a number of selected variables. An instructional product is defined as an instructional material or a group of materials that may or may not be tied to a specialized technique. But in the context of instructional technology, design plays a much larger role than the production of materials. It may include, among many other things, specifications for devices, settings, and even for certain aspects of staff behavior.

3) Production: The purpose of the production function is the creation, manufacture, and in some instances the location of resources which meet predetermined specifications. While the production function can be conceptualized in even broader contexts, instructional technology deals with production specifically as it relates to materials. Traditionally, such production has been the concern of commercial manufacturers. However, there is a growing trend towards "in-house" production by educational institutions themselves. Of all the development functions, production has received, generally speaking, the greatest amount of attention from alternative postsecondary education institutions.

4) Logistics: The purpose of the logistics function is the distribution of resources for instructional use. While the usual logistics concern is with the distribution of materials and devices, it may also be concerned with the acquisition, processing, storage, scheduling and maintenance of materials and devices.

5) Utilization: The utilization function is concerned with the systematic use of resources to provide instruction. An instructional technology approach produces a fundamental change in the way resource utilization is regarded. From a technological perspective the traditional expectation of face-to-face instruction via teachers is but one of a number of alternatives to be considered. Others include televised instruction, computer-assisted instruction, the use of specially designed workshops, and electronic learning laboratories. The instructional technology approach does not seek to replace teachers with electronic devices, but instead attempts to find the most efficient and effective ways to employ all available instructional resources, including faculty.

Instructional Management

Although the organization and management of instruction is a crucial component of any postsecondary education effort, a great deal of information exists already about management procedures in higher education. Suffice it to say that these functions assume a special importance in a technology-based system. It is through instructional management that the overall operation of the system and its components are planned, monitored and as necessary, modified.

Summary

The primary purpose of presenting this conceptual framework is to demonstrate the number of concerns that should be considered when alternative systems of postsecondary education are planned, designed, and implemented. All of these elements will not necessarily be important for every system, nor are the categories necessarily distinct from one another. We have merely listed a range of concerns and an approach which appears to be useful both for gathering data about existing efforts and for planning new approaches.

Although the instructional technology approach will work very well with existing institutions, it seems especially suited to the planning of alternative approaches, primarily because we are not familiar with the needs, interests, and aptitudes of the potential clients for these

systems. In addition, the commitment to ongoing evaluation of new projects meets the state's need for accurate determinations of the successes and failures of new ventures.

V. INFORMATION SYSTEMS

The theme of this report has been that planning for educational programs should be based on an instructional technology approach -- one that matches learner needs with appropriate subject matter, instructional techniques, and delivery systems. In a world of changing demands upon individuals (and therefore changing needs of individuals), of rapidly expanding knowledge frontiers in virtually every subject area, and of an exponentially increasing technological innovation rate, it is a tall order to expect of educational planners even modest success in the recommended matchmaking, without a systematic mechanism to provide both planners and clients of educational systems access to decision relevant information.

From the planner's point of view, relevant information might include enrollment trends across various demographic variables such as age, geographic location, institution attended, subject area, and course. From the client's point of view, relevant information might include regional or statewide course offerings, assessments of courses by previous enrollees, and cost of courses. Over the past decade there has been a steady growth in the number of information systems developed to find this kind of information. The systems are usually computer-based, typically called information storage and retrieval systems, and serve clients in

fields which range from American Portraiture (Catalogue of American Portraits) to water resource management (Water Resources Scientific Information Center). In this section of the report, we will briefly examine some of the functions, services, and products that might be expected of information systems; we will describe four existing systems; and we will enumerate some of the functions, services, and products that an educational information system might provide Californians.

Functions, Services, and Products

The activities of an information system or center correspond, in a crude way, to the activities of an individual seeking information. Information needs are ascertained; information is sought, organized and processed; and information is used. Depending upon the design of a particular system, different activities within this paradigm receive more, or less, attertion.

Typically, the determination of information needs is of primary concern during the design of the information system. The services provided by the system are responses to predetermined needs. Two general approaches in the definition of needs have emerged; an approach defining needs in terms of "disciplines" and an approach defining needs in terms of "missions." The National Chemical Information System of the American Chemical Association is an example

of the discipline approach. The Diabetes Literature Retrieval Project is an example of the missions approach. In defining the content of the information to be processed, the designers of an information system delimit the needs to which the system will respond. In effect, they determine the parameters of the domain within which the system will operate. Within that domain however, the systems function to keep pace with changing needs. The power of information systems is that they can be designed and managed to give highest priority to the collection, organization, processing, and use of information as it becomes relevant to a given clientele.

The functions which might be undertaken by an information center or system can be described as falling within some, or all, of the following categories: information collection, processing, storage, retrieval, dissemination, publication or reproduction, and information generation. Any of these functions may pertain to products -- such as documents or A/V materials; or to data -- such as course schedules or enrollment trends. An educational products library might collect, process, store and retrieve films or videotapes for use on a statewide basis. A postsecondary student information center might collect, process, store, retrieve and disseminate current information on alternative courses and enrollment figures within a particular geographic region. A statewide educational information system might be designed to carry on both of these activities.

The services provided by an information center or system might include some of the following: consultation and advice, referral, retrospective search, sponsorship of seminars and conferences, and replies to inquiries. Products provided by an information center or system might include bibliographies, indexes, abstracts, newsletters, directories, data sheets, statistical analyses, and handbooks. A prospective student visiting a regional educational information center might have immediate access, for example, to a frequently updated index of all courses offered within driving distance of his home, whether public or private, for credit or not for credit, for free or for a fee. An institution or teacher planning a course might request a listing of all similar courses taught throughout the state for the purpose of contacting other teachers and sharing materials. These are only a few conservatively imagined possibilities for the use of information centers and systems to keep existing educational services vital. We turn now to some examples of existing information systems within the United States.

Center and System Models

The ERIC System

Educational Resources Information Center (ERIC) is a national network of clearinghouses which was formed in the

mid-1960s to achieve the following three objectives:

1) To guarantee access to the world's English language literature relevant to education;

2) To generate new information on important topics in the form of bibliographies, state-of-knowledge papers, critical reviews, and interpretive summaries; and

3) To infuse information about educational developments, research findings, and outcomes of exemplary programs into educational planning and operation.

ERIC is funded by the National Institute of Education in Washington, D.C.

The network is composed of 16 clearinghouses in different parts of the United States, each one specializing in some specific area within the general field of education (e.g., ERIC Clearinghouse on Information Resources, Stanford University). Members of the ERIC staff at each clearinghouse maintain communication linkages with practitioners in their area of specialty who are likely to produce or obtain information of value to other practitioners. Linkages are maintained with professional associations, special study groups, and commissions. Submittal of information to the clearinghouse is solicited and materials are processed if they are of potential value to others, and if they are in a

form which can be photographed on microfiche (ERIC does not budget for the retyping of manuscripts).

Literature which is accepted by ERIC is abstracted and then indexed by staff members. The abstracts are sent to a commercial firm for proofreading and for the generation of a magnetic computer tape of the abstracts. The tape is used to generate the text of Resources in Education (RIE), a bibliographic index of literature in the ERIC system. It is also used to update a computerized bibliographic system containing the information in RIE which allows users to request computerized information searches by subject matter. The original literature, indexed to conform to the abstracts, is sent to a contractor for transfer to microfiche. Computer searches yield a computer listing of relevant materials which can be viewed on microfiche at any ERIC center and at many institutions that purchase ERIC microfiche libraries, or which can be ordered as printed copy from ERIC or from vendors who are listed on the computer printout in each citation.

In addition to the archival function of ERIC clearinghouses, other key functions receive considerable attention. Clearinghouses are often active disseminators of information. By virtue of the information collecting function of the clearinghouses, staff members are aware of areas within the domain of each clearinghouse which might be clarified through the commissioning of particular publications. There is

frequently an allocation in clearinghouse budgets for such commissioned publications. ERIC clearinghouses also allocate a portion of their budgets for providing public information about their activities. Potential users of the ERIC system are informed about ERIC activities through sponsored workshops and convention displays.

The Chicago Learning Exchange

The Chicago Learning Exchange is an example of an information center which is not yet computer-based, although it may soon be. It was founded in the spring of 1971 when a group of graduate and undergraduate students, a professor, and interested people from the greater Chicago area, meeting at Northwestern University's Center for Urban Affairs, decided that some mechanism was needed which could bring people who wanted to learn together with people who wanted to teach. What emerged was a "not-for-profit" organization with a borrowed office and telephone, a small file box filled with 3 x 5 index cards, and a $25 grant from a Northwestern University dormitory.

The Learning Exchange continues to function in basically the same way it did in 1971. As described in their 1974 catalogue:

> To use The Learning Exchange, just call 272-3383 between 9 a.m. and 9 p.m. Monday through Friday or between 9 a.m. and 5 p.m. on Saturday and tell us what you want to do.

We will then do either or both of the following, depending upon your wishes:

. We can check the card catalogue files to see who is listed under the subject(s) you are interested in. If you want to LEARN something, we will give you the names and phone numbers of people who are teaching that subject. If you have questions or need advice about a subject (e.g., French History, travel, electrical work, vegetarianism), we will give you the name of the expert you need. If you want to TEACH something, we will give you the names of people who want to learn your topic. And if you want to meet people who SHARE YOUR INTERESTS, we will refer you to people who have called expressing a similar interest.

You then call the people whose names you receive, decide who you want to meet with, and make all arrangements necessary for a class, discussions, recreational activities, or whatever you are interested in doing. If you just need to talk to someone who can answer your questions about a particular subject, the telephone itself can serve as a 'meeting place."

We can list you in the files as wanting to teach, to tutor, share your interests or concerns, or answer questions. Future callers who suit your needs, abilities, or interests will then be referred to you.

Four full-time staff members with four telephones and an information bank of about 30,000 file cards currently comprise the Learning Exchange. Since 1971 over 20,000 people have been brought together to study such arcane topics as Aura Research, Autohypnosis and Apparitions, as well as

hundreds of more conventional topics. About 40% of the teachers listed in the exchange charge a fee, but many use a sliding scale based on the learner's ability to pay. The Learning Exchange has been dependent upon foundation grants to raise what is now a projected annual budget of nearly $60,000, but under consideration is a proposal to charge a membership fee of $15 a year to move the organization towards financial independence.

The National Clearinghouse for Alchohol Information (NCALI)

The NCALI is a single contract clearinghouse run by General Electric Corporation (GE) for the National Institute on Alcohol Abuse and Alchoholism. NCALI is unusual as an information center in a number of ways. For a single clearinghouse, it carries on a broad range of activities. These include: the acquisition of materials, analysis and referencing materials, programs to promote public awareness, technical publications, computer liaison, media communications, and warehousing and distribution of materials. The Director of the clearinghouse is not a GE staff person, but an appointee of the National Institute on Alcohol Abuse and Alcoholism. The Director works with the senior staff, especially the clearinghouse manager, who fills the senior GE staff postion.

The Clearinghouse acquisitions department obtains materials from many sources. NCALI subscribes to over 200

journals and 125 newsletters. A microfiche library of relevant doctoral dissertations is maintained. The Clearinghouse also covers peripheral literature by checking such sources as Ascatopics, Chemical Abstracts Condensates, Index Medicus, Smithsonian Information Exchange and various related computer managed information data bases.

Analysis and reference activities involve the abstracting and editing of new materials, responding to questions which require some research (about 125 per week), producing bibliographies, and conducting special reference projects such as compiling information regarding state sponsored activities in the area of alcohol abuse, on a state-by-state basis.

The current awareness clearinghouse activities are essentially "outreach" activities. Information received by NCALI is sorted into 110 specific subject areas and abstracted information descriptions are mailed to those persons who have indicated an interest in one or more of the areas. The entire documents from which the descriptions have been abstracted are, of course, available through the clearinghouse.

The technical publications section is responsible for two major publications, a monthly newsletter, "Alcohol and Health Notes," and a quarterly bulletin. The bulletin, "Alcohol Health and Research World," contains articles on such topics as disadvantaged populations, new treatments,

and preventative programs. The newsletter (100,000 mailed each month) reports on the latest news in the alcoholism field.

The computer liaison section is responsible for all activities involving the maintenance and updating of the computerized data base. The data base is used largely for retrospective searching to provide bibliographic information on particular subjects, in response to user requests. The computer liaison staff is also responsible for writing special programs and producing mailing lists.

The communications and media section is responsible for the dissemination of television and radio spots as public service messages. An attempt is made to trace the impact of these messages on particular audiences throughout the country.

The warehouse and distribution activities include the stocking of all available NIAAA publications and the distribution of them in answer to requests. About 1,500 standard pamphlets and publications are distributed each week and about 400 packages of materials are prepared for special requests.

The National Information Center for Educational Media (NICEM)

The National Information Center for Educational Media (NICEM) is a computer-based bibliographic information storage

and retrieval system run by the University of Southern California. The NICEM data bank contains over 400,000 entries describing eight different kinds of non-book media, and a complete file of producers and distributors of these materials. Every two years, eight comprehensive single media indexes are published: Index to 16mm Educational Films (3 Vol.), Index to 35 mm Filmstrips (2 Vol.), Index to Educational Records, Index to 8mm Motion Cartridges, Index to Educational Overhead Transparencies and Index to Educational Slide Sets, plus Index to Educational Audio Tapes and Index to Educational Video Tapes. The Center also publishes five multimedia indexes on popular topics such as psychology, ecology, and Black history and studies. An up date program provides current information between publications of indexes with monthly suppliments to the major indexes.

The staff acquires information from media producers, distributors, the Library of Congress, media centers, and libraries. Editorial researchers describe the material's subject matter, appropriate grade level, producer, distributor, and other information necessary for users who might want to order them. The information is then entered in the data base and is available for special searches (for example, a fourth grade teacher might request a listing of all A/V materials available on the subject of energy conservation), and is also available for the automatic listing required for biennial publications and monthly supplements.

By 1976 NICEM expects to offer all their publications in microfiche. This will substantially lower the cost of institutional subscriptions to publications. Also planned is the development of on-line information search and retrieval capability which would allow NICEM users throughout the country to access the NICEM data bank remotely.

An Education Information System for California

The four information systems described represent different approaches to the problems of fulfilling particular information needs. The ERIC system is a multi-center, national, discipline-oriented, computerized information storage and retrieval system which carries on a range of activities and functions on an annual budget of between $5 and $6 million. The Chicago Learning Exchange, in contrast, is a single center, mission-oriented (bringing Chicagoans together), manual information storage and retrieval system which has a single function and an annual budget of less than $60,000. The National Clearinghouse for Alcohol Information is a contract (for profit) clearinghouse operated by GE and directed by a federal employee of the National Institute on Alcohol Abuse and Alcoholism. It is a mission-oriented clearinghouse with a comprehensive set of activities. Finally, the National Information Center for Educational Media (NICEM) is a non-profit information center with

a single function, the compilation of indexes of available educational media materials.

Each of the above systems has characteristics that might be profitably modeled by the designers of an educational information system for California.

1) Modeled after the ERIC system, a California educational information system might best serve its clientele through regional centers linked by a common computerized data storage and retrieval system.

2) Modeled after the Chicago Learning Exchange, a California educational information system might well serve by helping clients share resources in institutional as well as non-institutional contexts.

3) Modeled after the National Clearinghouse for Alcohol Information, a California educational information system might best serve as a single comprehensive information system, perhaps based on contracted computer facilities.

4) Modeled after the National Information Center for Educational Media (NICEM), a California educational information system might offer an indexing system listing educational materials, print and non-print,

used by California institutions and available to other institutions. This information should be immediately retrievable through on-line subject searches.

The design of an educational information system for California is a task of substantial complexity. The design process should be based on a careful cost-effectiveness analysis of alternatives for meeting the informational needs of Californians. This analysis should be followed by a comprehensive plan to create a computerized storage and retrieval system which would provide access to information including:

1) Services Offered: Facilities available (e.g., media); individuals willing to teach (learning exchange).

2) Courses and Programs Offered: Assessment of programs; characteristics of students enrolled; description of kind of certification or credit, if any, awarded upon completion; when and where offered.

3) Instructional Products Available: Print and non-print where available; cost, if any; assessment.

4) Student Characteristics: For trend projection and planning.

The information system should have the following characteristics:

1) Easily Updated: Current enough for student use on a quarter-by-quarter basis.

2) Accessible: To anyone in a variety of forms -- print catalogues, summary pamphlets, on-line searches -- with access points close enough to anyone to be visited within a reasonable amount of time.

VI. CONCLUSIONS AND RECOMMENDATIONS

Listed below are those conclusions in the area of instructional technology and media which appear to us to be most relevant for non-traditional postsecondary education in California:

1) MEDIA PER SE, AS A VEHICLE OF INSTRUCTION, NEITHER ADDS TO NOR DETRACTS FROM LEARNING. LIKE INSTRUCTION IN A TRADITIONAL CLASSROOM IT CAN BE WELL DONE OR POORLY DONE.

In California there are ample examples of failures and successes in the use of both traditional and mediated instructional techniques. There is a popular impression that instruction via the media is academically less respectable than classroom instruction. We disagree. We believe that this misimpression is based upon the comparison of occasional but highly visible failures in the use of media and "invisible" failures in traditional classroom settings.

2) IN CALIFORNIA THERE IS AN ABUNDANCE AND DIVERSITY OF EXISTING FACILITIES AND EQUIPMENT FOR MEDIA-BASED INSTRUCTION.

Most previous studies of the availability of media facilities and equipment in California have reached the

above conclusion, and our efforts to check the accuracy of these findings do not lead us to suggest otherwise. To the contrary, with declining enrollments in postsecondary institutions and decreasing revenue available for the use of media, existing facilities and equipment are less used now than they previously were.

3) THERE IS CONSIDERABLE EVIDENCE THAT EXISTING FACILITIES AND EQUIPMENT ARE DECENTRALIZED AND UNNECESSARILY DUPLICATED WITHIN POSTSECONDARY SEGMENTS AND INSTITUTIONS. IN ADDITION, WE KNOW OF NO POLICY INTENDED TO AVOID UNNECESSARY DUPLICATION AND DECENTRALIZATION. AS A CONSEQUENCE, THERE IS UNHEALTHY COMPETITION FOR AVAILABLE REVENUE TO SUPPORT EXISTING MEDIA FACILITIES AND EQUIPMENT.

There is interest in each of the postsecondary segments in the increased use of media for instruction. The growth of regional ITV consortia and the establishment of the Ventura Learning Center are evidence of segmental cooperative interests and ability. However, as a partial result of competition for revenue the instances of cooperation are too few.

4) THE MOST SUCCESSFUL EXAMPLES OF THE USE OF INSTRUCTIONAL MEDIA THROUGHOUT THE NATION AND THE WORLD HAVE BEEN FOUND IN ALTERNATIVE POSTSECONDARY EDUCATION PROGRAMS WHERE STUDENT'S INSTRUCTIONAL NEEDS ARE ASSESSED AND WHERE INSTRUCTION IS SYSTEMATICALLY DESIGNED, DEVELOPED, EVALUATED, AND REFINED TO MEET THOSE NEEDS.

Postsecondary educational institutions have had many years of successful experience providing instruction to traditional students. However, the non-traditional student has been a more recent client for postsecondary education and our instructional experience is more limited. Community colleges have had more experience providing instruction to non-traditional students than have other segments, and we suspect that their success is in large measure attributable to their willingness to occasionally employ systematic techniques and to investigate the use of innovative delivery systems.

5) IN CALIFORNIA, THE MEDIA AND TECHNOLOGY AREA COVERS A WIDE RANGE OF ACTIVITIES. MANY DIFFERENT PROFESSIONAL GROUPS ARE INVOLVED IN AND ADVOCATE THE USE OF DIFFERENT DELIVERY SYSTEMS IN A VARIETY OF

SETTINGS WITH DIVERSE APPROACHES TO NON-TRADITIONAL POSTSECONDARY PRACTICE AND PHILOSOPHY.

Educators involved in non-traditional programs in other states and nations have found that an instructional technology approach, because of its general applicability, is useful in bridging the gap between these groups and is effective in providing instruction to large and heterogeneous populations.

6) CURRENTLY, THE MOST IMPORTANT BARRIERS TO NON-TRADITIONAL MEDIA-BASED POSTSECONDARY EDUCATION IN CALIFORNIA ARE THE AVAILABILITY OF (a) SYSTEMATICALLY DEVELOPED AND EVALUATED COURSEWARE (PROGRAMS AND SUPPLEMENTARY MATERIALS; (b) UP-TO-DATE AND ACCESSIBLE INFORMATION CONCERNING (i) THE LOCATION AND AVAILABILITY OF FACILITIES, EQUIPMENT AND COURSEWARE THAT MIGHT BE INCORPORATED IN TECHNOLOGY-BASED INSTRUCTIONAL SYSTEMS, (ii) EDUCATIONAL NEEDS OF NON-TRADITIONAL STUDENTS, AND (iii) CONSTRAINING FACTORS THAT LIMIT THE ALTERNATIVE WAYS THAT INSTRUCTION MAY BE DELIVERED; (c) A SUFFICIENT NUMBER OF PROFESSIONALS TRAINED IN THE WIDE

RANGE OF SKILLS REQUIRED OF THE INSTRUCTIONAL TECHNOLOGY; AND (d) SUFFICIENT INCENTIVES FOR COOPERATIVE VENTURES BETWEEN INSTITUTIONS AND SEGMENTS.

Previous experience has shown that some of the costs for courseware may be recouped through sales to other states if it is academically and technically sound. Non-traditional programs in other states have found that more systematically produced courseware may reduce the large student attrition rates that currently exist in non-traditional programs, that non-traditional students require courseware in a variety of formats (e.g., print, visual, aural) plus contact with teachers and/or tutors. We have found that the availability of timely and accessible information (about courseware, facilities, student needs, programs, etc.) is a problem experienced by all existing non-traditional programs, and that professionals who are involved in those programs have expressed a need for comprehensive state information systems. Although no such comprehensive system currently exists, there are a number of systems that could serve as models for California.

Although some postsecondary educational institutions have begun to hire instructional technologists, there are not enough of these professionals currently working in California's postsecondary system. However, we have noticed that increasing numbers of media-oriented professionals are

seeking additional training in instructional technology. Other states have found that technology-oriented postsecondary instruction requires the teamwork of a variety of specialists, including the instructional technologist.

Our recommendations to the California Legislature are as follows:

1) DEVELOP REGIONAL INFORMATION CENTERS WHICH WILL GATHER, ORGANIZE, AND PROVIDE ACCESS TO INFORMATION INCLUDING:

   a) Services Offered: Facilities available (e.g., media); individuals willing to teach (learning exchange).

   b) Courses and Programs Offered: Assessment of programs; characteristics of students enrolled; description of certification or credit, if any, awarded upon completion; location and time course is offered.

   c) Instructional Products Available: (Print and non-print) where available, cost if any, assessment of.

   d) Student Characteristics: For trend projections and planning.

2) ADOPT A POLICY OF FUNDING NEW NON-TRADITIONAL POSTSECONDARY EDUCATIONAL PROGRAMS WHICH DEMONSTRATE THE GREATEST COMMITMENT TO:

a) Fully utilizing existing resources (materials, facilities, personnel);

b) Addressing educational needs of highest priorities;

c) Involving institutions across educational segments;

d) Sharing the materials developed by the program(s);

e) Systematically designing programs and assessing program effects.

Funding should be for the short term only, lasting no longer than two years. Successful programs, those that attract clients and achieve instructional objectives, should be shifted whenever possible to segmental institutions for regional or statewide use.

3) ESTABLISH A POLICY AND REVIEW BOARD TO DETERMINE THE PRIORITIES FOR NON-TRADITIONAL POSTSECONDARY EDUCATION

PROGRAMS (BASED UPON NEEDS ASSESSMENTS), AND TO DETERMINE PROCEDURES FOR GRANT PROPOSAL SOLICITATION AND GRANT AWARDS.

4) CREATE A STATE LIBRARY OF INSTRUCTIONAL MATERIALS, PRINT AND NON-PRINT, WHICH HAVE RESULTED FROM PROGRAMS DEVELOPED THROUGH GRANT AWARDS, TO BE MADE AVAILABLE FOR FUTURE EDUCATIONAL PROGRAMS.

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